THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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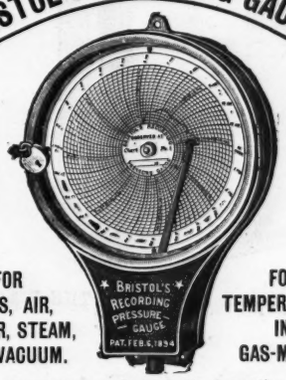

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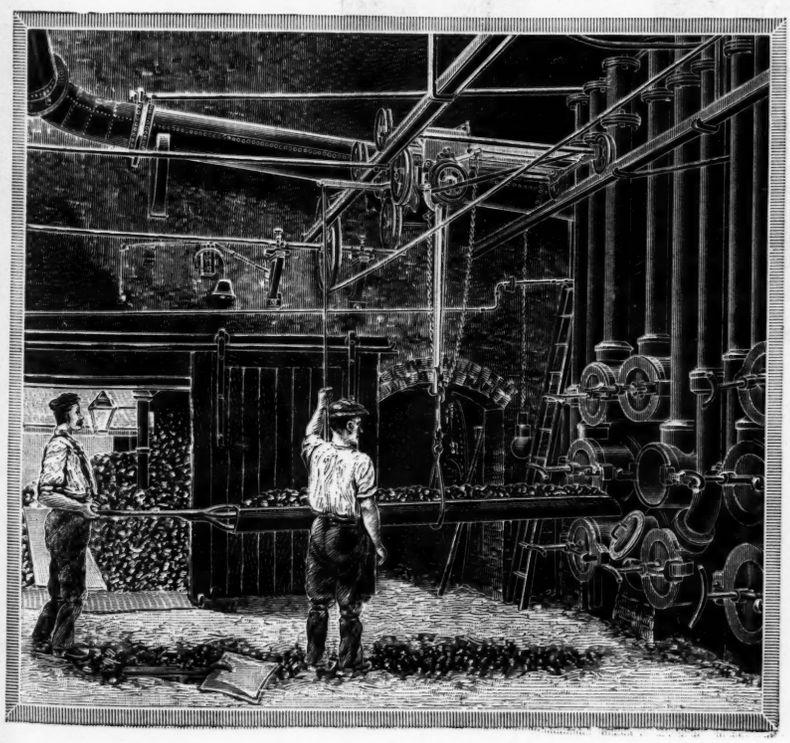

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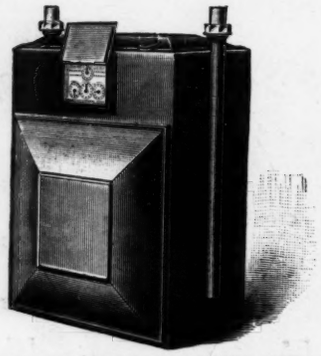

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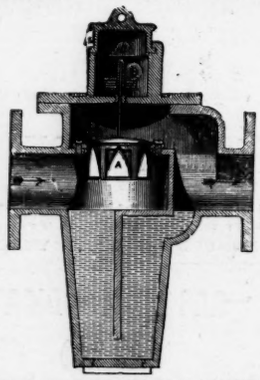

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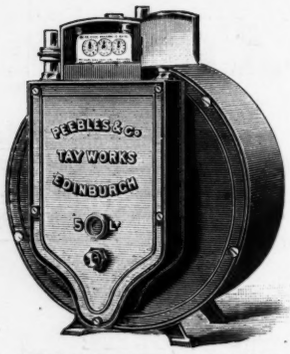

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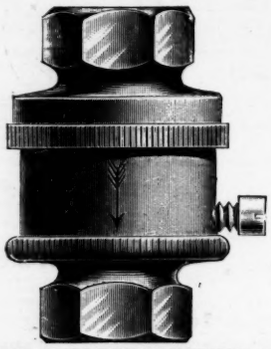

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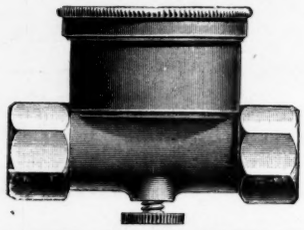

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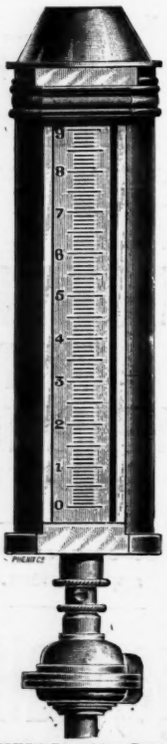

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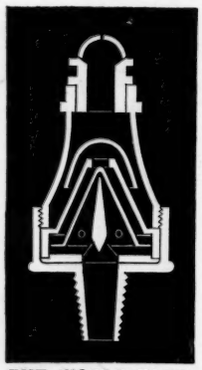

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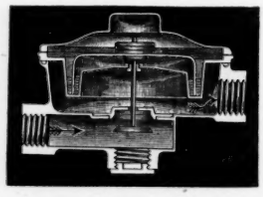

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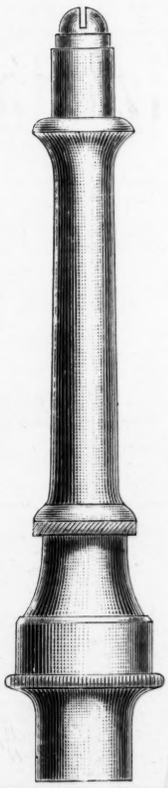

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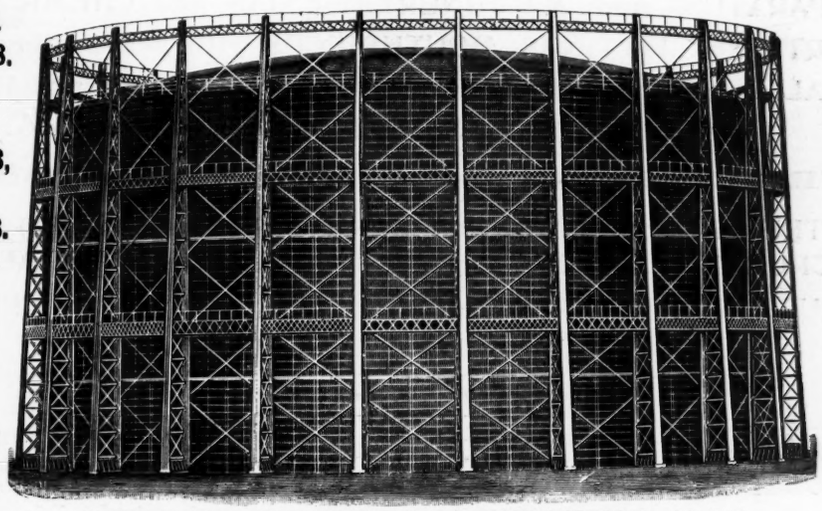

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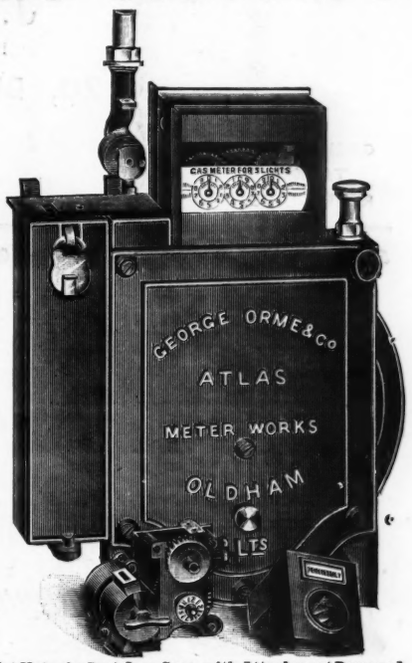

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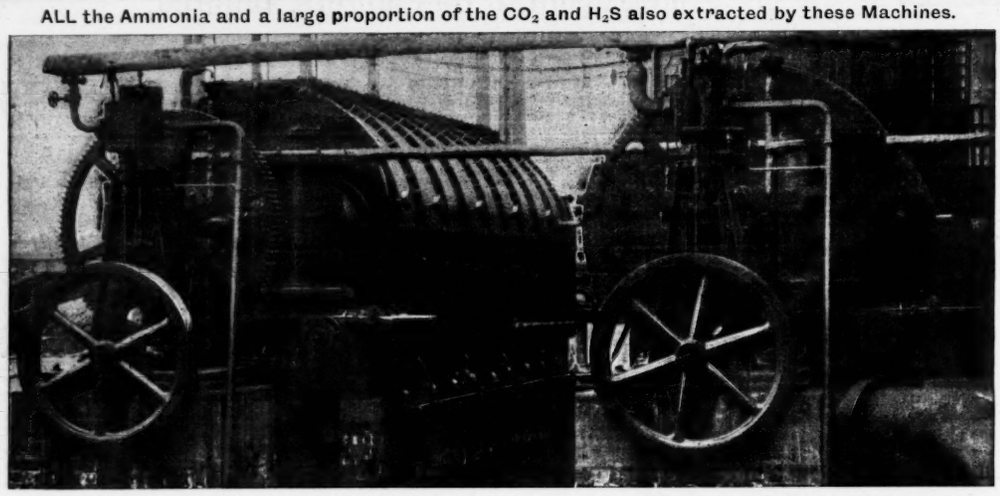

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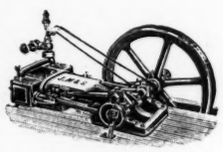

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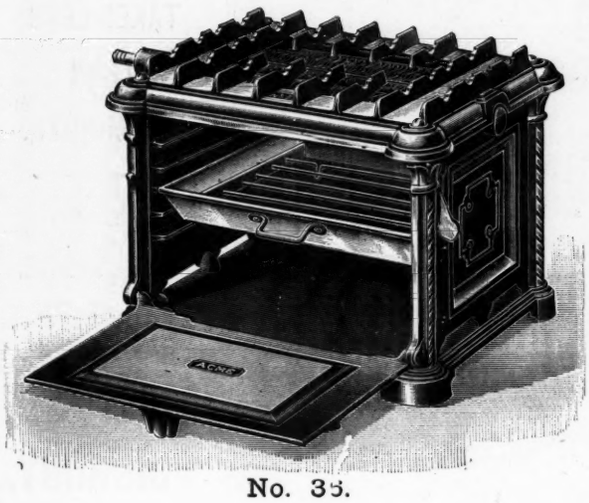

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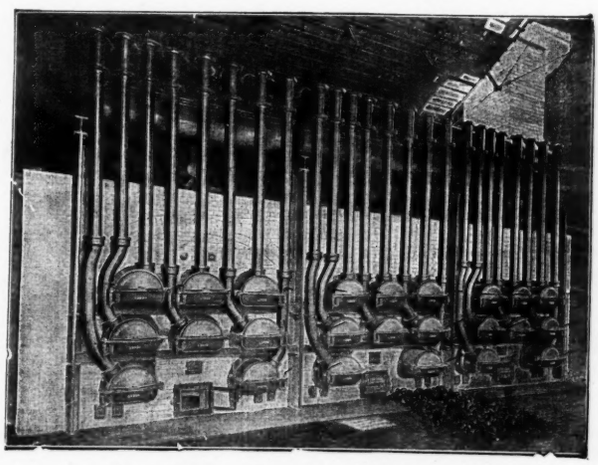

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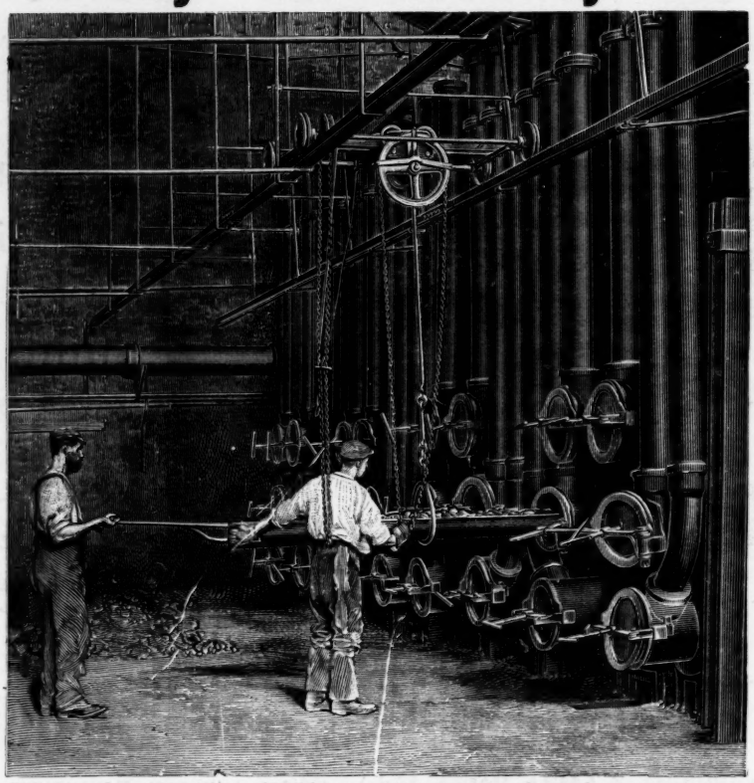

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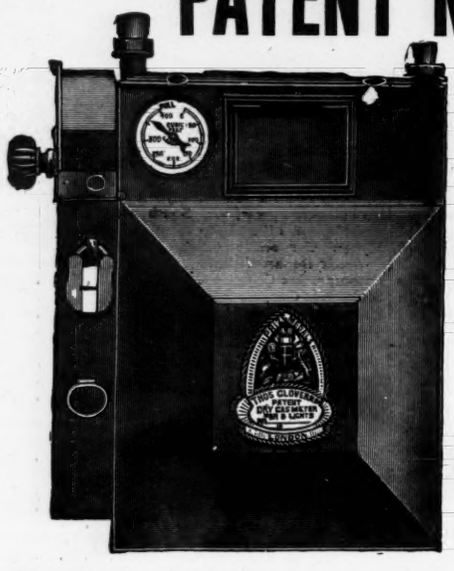

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EDITORIAL NOTES.

The State of Plymouth Corporation Finances.

AMIABLE theorists who read papers and write newspaper articles in praise of municipal Progressivism should be freer than they usually are with evidence of the validity of their opinions on the subject. They have accustomed us to distinguish between what is respectively called the remunerative, and the unremunerative capital expenditure of local authorities; and whenever anybody raises a note of alarm at the enormous and fast-growing local national debt of the country, they are very handy with the reference of the bulk of it to the so-called "remunerative" category. They omit to acknowledge that the precious distinction is rather theoretical than real, as the debt is debt all the same. For such dangerous apologists for the rule of the money-lender over nominally free British boroughs, a careful study of the present state of the Plymouth Corporation finances, as laid bare in the last report of the Treasurer, should be salutary. Plymouth has "outrun the constable;" and the Borough Treasurer has been constrained to utter a grave warning to the Town Council, "to use the greatest economy, and to "carefully consider the financial results of any new schemes "that may be brought forward before embarking on them," as it appears to him that, what with the outstanding liabilities, and the uncertainty as to whether any of the so-called remunerative enterprises will prove to be remunerative at all, "it is very needful to keep a watchful eye on expenditure "of all kinds."

Naturally, this impressive caution has created an uneasy feeling in the local public mind. What? With all the interesting possibilities of the future in respect to such Progressive proceedings as the rehousing of the working-class population yet untested, must the Corporation cheque-book be put out of the reach of spending Committees? Alas! it appears so. Then, how has the town been brought to the length of its financial tether? Simply by over-indulgence in the prevailing vice of municipal finance—shirking the bills. Taking the capital account first, at the end of the financial year the borough owed to the bankers £193,896. In reality, the balances due to the bankers totalled up to £308,495. This was made up of advances on account of main-drainage works, sewers, street improvements, suspense accounts, artisan dwellings, and the tramway, electricity, and water undertakings. On the other hand, there were various balances in the bankers' hands, which left the net indebtedness at the figure first stated. The Corporation had exceeded their statutory borrowing powers by no less than £226,742. Since March 31, arrangements were made to repay the bankers the net amount due to them, by the issue of £200,000 of Plymouth Corporation stock. This was managed by borrowing partly on sanctions for works in progress, and partly by exercising sanctions for works not yet commenced. Thus, although the bank was paid off, the method employed was unsatisfactory; for on the one hand, as the money is expended on those works for which it has been received, the overdraft will again accumulate, while if the works are delayed in order to prevent this, the sinking fund charges will run on and be an unnecessary burden on the rates. Next, there are nineteen suspense account items, borrowed and held over instead of being charged to current account against the rates. It is the old story—cover every adverse balance up somehow, anyhow, rather than charge it to the rate-fund.

The case of the "remunerative" works is also typical. Tramways are a recognized asset of productive value. Those of Plymouth are a dead loss; and the amount lost year by year has been held in suspense, and the interest paid in respect thereof charged to the suspense account. The undertaking has thus been saddled with compound interest upon its annual losses; the interest amounting to £1200. The system has now been partially electricized, and great things are expected of the change. But the Treasurer advises the Corporation to wipe out the old deficiency and establish a really satisfactory reserve or depreciation fund before they think of transferring any profits in aid of rates. The tramways capital account is overdrawn, like the rest. On the Borough electricity works, the loss up to the end of the municipal year was £3173; and the Engineer estimated that, by the end of the current year, it will stand at close upon £5000. Here is a "steadier" for those who profess unbounded faith in the remunerative character of municipal electricity supply! The annual losses have been treated in the same way as the others—carried to suspense account, together with the interest on the deficiency. The Treasurer advises the Council to transfer the deficit to the general district fund, and meet all future losses in the same way. The Water estate has been bled unmercifully, until now the balance is on the other side, and (of course) there is no renewal or reserve fund.

All this financial mismanagement has gone on in flat contravention of minutes of the Council; and it will be a serious matter to set things straight by borrowing the necessary amount to correct the capital account, to charge all deficiencies to revenue, and to raise the rates to the figure required to balance the account. The town has been kept in a Fool's Paradise by the Corporation; and now somebody must perform the unpleasant duty of making a clean breast of it. As to the town debt, its amount is already enough to daunt even the hardiest Progressive. It aggregates about £18 per head for every man, woman, and child in the borough; representing an annual charge for interest of something like 17s. 6d. per head. Although something of this indebtedness is classified as for "remunerative" works, the present trouble is that, for one reason or other, these undertakings have not as yet proved very remunerative to anybody. There is at least one bright spot in the circumstances of Plymouth—the gas supply is among the cheapest in the kingdom; but then, the undertaking is not a municipal property, which perhaps accounts for it.

Mr. Carpenter's Congress Paper.

ONE of the most valuable papers for practical gas manufacturers read at the Glasgow Congress, was that contributed by Mr. Carpenter, the Chief Engineer of the South Metropolitan Gas Company, on the "Application of the Unit "System of Gas Manufacture to its Purification." The author must have been at some difficulty in selecting a proper title for his paper; but what he meant came out clearly enough in the course of his text. Mr. Carpenter dealt with a problem which none but an engineer in charge of works of the largest magnitude could hope to treat effectively; and he handled the subject like a master. The question posed is, as Mr. Foulis, who presided over the Gas Section at the time, pertinently observed: What size should gas-works plant be made in order to obtain the best results? The reason why the solution of this problem rests with the engineers of the big works is plain; but it may as well be stated. They can do as they think best; while the smaller operators must do the best they can. This is one of the few technical advantages enjoyed by the engineer of a large manufacturing establishment, as compared with one who has to work upon a limited scale. All gas-works, as Mr. Carpenter pointed out, so far as carbonizing plant goes, are merely greater or smaller multiples of one unit, which is the retort. Practically, they are multiples of the retort-setting; and even in making this point, Mr. Carpenter's aptitude for analysis and classification inspired him to give a table showing how retort-benches can be adjusted to give the ordinary variations of output required in seasonal working.

Having thus struck the key of his discourse, Mr. Carpenter went on to point out how this method of proportioning the production of gas by the most convenient unit could be applied to the subsequent treatment of the make. This is where his advantage as manager of large works became conspicuous. For whereas in a small works there must be all the elements of purifying plant, these have to serve for all the year round; and if the manager knows they are too big for the summer and too small for the winter, he cannot help it. While such a condition of working prevails, he is not likely to trouble himself overmuch to ascertain when the plant is really doing its best; and consequently such an operator is never likely to come by experience at exact knowledge of

the best proportions of apparatus to the work required of it. This the engineer of large works can do; and certain it is, Mr. Carpenter has done it. The subdivision of plant, considered as distinct from the idea of the multiplication of a previously determined unit, is, of course, an old method. The former practice provides the ground for the position occupied by Mr. Hunt in the discussion on the paper. He was familiar with the subdivision of the whole make, for prudential considerations, and also probably out of regard for structural requirements. Two station meters, for example, are preferable to one, when more than a certain quantity of gas has to be measured. They will take the make of gas between them in the winter season; and in summer one will suffice for the work, while the other is laid off for examination, cleaning, and repairs. The difference between the principle here, and that enunciated by Mr. Carpenter, is that he proposes efficiency as the test of the proper size of the unit of plant, and, if necessary, multiplies units on this scale. This is multiplication, not division. The difference is fundamental. Mr. Carpenter claims, further, that multiplication is worth doing, as he does it; because he has found that two purifiers, or two scrubbers, do not merely mechanically divide the make between them, like so many meters or exhausters, but that there is a proportion of size to working efficiency of gas purifying plant which it pays to determine and adopt as a unit.

That is the sum and substance of the paper; and it is well worth setting forth, as every engineering reader will readily admit. Though the discovery was made by the manager of a large gas-works, and its application will have its widest scope in such establishments, there is not a small works manager in the land who will not be helped by the knowledge that he need not put in all the weight of iron purifying vessels that could be plausibly suggested, "in order to be "on the safe side;" but that there is a rational method of proportioning plant to its work.

"Sweet are the Uses of Advertisement."

Although the virtues of advertising are not so strongly impressed upon the minds of sellers of gas in this country as they are of necessity in America, gas companies are gradually becoming awake to the fact that it is not sufficient to make a good article; if they wish to sell it, they must adopt means to make its value known. A few years ago, a show-room for the display of stoves and fittings and other apparatus for the economical and effective use of gas, made the town which possessed it quite distinguished for its progressive spirit. To-day such adjuncts to the business of gas companies are fairly numerous; and though many towns have not yet been inspired by the new ideas, there is a wider acknowledgment of the truth as it is understood in trade, that to make a thing go you must push it. Still, apart from the show-room or the occasional gas exhibition, there is certainly little attempt on the part of gas makers to get at the prospective consumer and persuade him of the advantages which will accrue from the use, or a more extensive use, of gas. A well-managed show-room in a prominent position is doubtless the best of all advertisements. Even a gas exhibition—though its object may be to push the sale of one or two trade articles and demonstrate their supposed superiority to rival contrivances—is not to be despised as an adjunct to the work of the pushful gas manager.

But when all is said and done, we do not act as though we understood the advantages of the system so extensively adopted in the United States, of pushing the sale of gas by means of advertisements in local newspapers, circulars addressed to householders, posters placed upon the walls, and even canvassing for custom. The difference between the methods adopted in the two countries is not wholly due to our want of appreciation of the benefits of advertising. It arises in the main from the difference in the circumstances. The British gas manager knows that if anyone wants gas in the area over which he has charge, it must be bought from him and him alone. In many towns in America, the customer has the choice of at least two supplies; and the gas company, like the storekeeper, has in its own interest to adopt all sorts of typographical devices to persuade the possible customer that he will be better served in patronizing its establishment rather than the one over the way.

Though the conditions are so unlike, there is, nevertheless, scope in this country for a wider application of advertisements' artful aid in the distribution department of the up-to-date gas-works. This is especially the case where the electric light either is or threatens to become a serious rival of gas. The lesson seems to have been well learnt in at all events one West of England town, where the hoardings are now adorned with bills calculated to arrest the attention of the "man in the street," and compel him to remember the dark nights to come. The Gas Company in the town in question has for some years had in use a bright and attractive show-room. Its one disadvantage has been that it is situated in a side street, a little apart from the main stream of traffic. Larger premises have now been secured in one of the principal thoroughfares; and a flaming poster draws attention to the fact. Headed "Lighting Season, 1901," it goes on to call attention to the change in the following style: "We are moving. All our stock to be sold cheap. "Rock bottom prices. Call and see it." Then follows a list of the different classes of fittings: "We have drawing-"room pendants, shop-lights, shop-lamps, brackets, hall-"lamps, and every description of incandescent fitting." It is all set out in large type and is accompanied by illustrations of the make of cooking-stoves which the Company let out on hire. Of course, it challenges comparison with the advertisements of the soap makers and the inventors of patent pills and all the rest of the host of traders who have found fame and fortune in lavish expenditure on advertising. For this reason, it will appear offensive to those who look upon such things with eyes which have been accustomed to old-fashioned, quiet, unobtrusive methods of conducting gas business. Yet, after all, gas-works are carried on for profit; and as in most cases, more business and larger production mean more profit, there is no harm (but rather good) in the adopting of such legitimate means as advertising to secure more customers, and induce the customers when secured to consume more gas where it suits their interest to do so.

Mr. Price-Williams on Coal Statistics.

Pressure on our space prevented us from dealing last week with the letter which was published from Mr. Price-Williams, in answer to criticisms of his statistics contained in our first "Editorial Note" of the 3rd inst. Mr. Price-Williams, seeks to correct in the commencement of his letter an error which we never made. He says that we were mistaken in the assumption that he arrived at the difference of 313½ million tons between the estimated and the actual consumption of coal during the last thirty years, by "intricate calculations." We did not—as Mr. Price-Williams will see by referring to the original article—assume that he had so arrived at the figure; it was obviously the difference between the two totals. The calculations to which we referred were those by means of which he arrived, when working for the Commissioners, at his estimates of the home consumption of coal during the years then to come.

Those calculations, as was pointed out, were incorrectly made; the total for each decade being estimated at ten times the maximum year's consumption, instead of at ten times the mean consumption. Had the calculations been worked out correctly, the estimate for the thirty years would have been remarkably close; the under-estimate as to the growth of population being practically balanced by the small over-estimate of the *per capita* consumption of coal. The actual average coal consumption in the United Kingdom per head of the population of Great Britain for the 30 years was 4·28 tons. Mr. Price-Williams, on behalf of the Commissioners, estimated the average to be 4·43 tons, but so worked out his figures as to give a total equal to an average consumption per head of 4·76 tons, or 0·13 ton higher than the maximum figure of 4·63 tons estimated by him as the average consumption for 1901. The fact, therefore, that the actual result fell short of the estimate by 313½ million tons, is *not* to be explained by "greater economy in the consumption of "coal during the period in question" (4·28 tons per head) as compared with the estimated average consumption, 4·43 tons per head.

What Mr. Price-Williams means when he says that the only calculations alluded to in his letter to "The Times" were "those relating to the period of exhaustion of the remaining "coal supplies in the known coalfield areas, which con-"clusively show that, should the present export of coal (of "58½ million tons annually) continue to increase at the high "average rate of 5½ per cent. per annum maintained during "the last 30 years, the coal exports alone would exhaust the "92,000 million tons in about 83 years," we cannot understand; seeing that in that letter he alluded to the estimates made 30 years ago, "the working out of most of the calcu-"lations" in which "was entrusted," he says, "to me." As

to the foregoing calculation in regard to the exports, we can only say that our readers need not let it alarm them. The exports in 1881 exceeded those in 1871 by 100 per cent.; the exports in 1891 exceeded those in 1881 by 60 per cent. Those in 1901 will probably exceed the exports in 1891 by 45 per cent. So it will be seen that the rate of increase per cent. is rapidly diminishing. During the now closing decade (including, as it does, three years of abnormal export trade), the increase has only been at the rate of slightly over 3 per cent. per annum, compared with the 5½ per cent. on which the alarmist estimate of Mr. Price-Williams is founded.

Then Mr. Price-Williams says: "As regards my having "included as available sources of future supply all the coal "at depths exceeding 4000 feet, to which you draw atten- "tion, I should state that this was done intentionally; my "object being to show that, even if *the entire coal resources* "of the kingdom were available," &c. But Mr. Price-Williams, in his original letter, spoke of "an available "supply of 97,528 million tons of *workable* coal" in the known coalfield areas; of 48,465 million tons in undisclosed coalfield areas; and of a total "huge store" of "over" 146,000 million tons (97,528 + 48,465 = 145,993). Now 97,528 millions is the estimate given by the Commission as including both workable (90,207 millions) and unworkable (7321 millions) coal in the known areas; while their estimate of the contents of the undisclosed coalfields was: Workable, 56,273 millions; unworkable, 41,144 millions; total, 97,417 million tons—making "the entire coal resources "of the kingdom:" Workable, 146,480 millions; unworkable, 48,465 millions; total, 194,945 million tons. Mr. Price-Williams quoted figures which are altogether incorrect, and his explanation as to what he intended to do serves only to emphasize the fact.

A Fresh View of the Taff Vale Case.

Quite the most amusing, and not the least instructive, of the many legal comments that have appeared in the newspapers upon the House of Lords' judgment in the Taff Vale Railway case was published by the "Pall Mall "Gazette" of Thursday last. The paragraph began with the remark that "It is just possible that the Trade Unions "have taken a fright at recent decisions too easily." This observation, differing so seriously from everything that has hitherto been advanced on the subject from the side of the Trade Unions, was calculated to arouse curiosity as to its basis. It is supported by reference to a minute analysis of two judgments—the Taff Vale case and *Quinn v. Leathem*—by some unnamed writer in the "Law Journal," who arrives at the conclusion that, in the latter case, the Irishmen "went too far, and the excess consisted in their atti- "tude towards non-members of their Union." He thinks that, if they had only dealt with their fellow Unionists, they would have been within the law. "They must not threaten "—*voilà tout*. As to the Taff Vale case, the Union, as such, "has only to do nothing, and it cannot be hit." This is deliciously lawyer-like, and smells of the still atmosphere of "chambers."

What would be the good of having a Trade Union that did nothing? And what satisfaction would a gang of Trade Unionists feel in "dealing"—not by threats—with their own fellow members? If the Union man must not even threaten the "blackleg," and if the Union itself must remain idle while the free labourers pass to and fro upon their lawful occasions, then what does the subscribing member get for his money? These much-discussed judgments reveal to the outer world one thing among others, which the amiable outsider has not hitherto suspected—that the power of militant Trade Unionism consists mainly in illegality and the organization of violence. Bring all such societies under the power of the law, and the most troublesome of them must disappear. This category includes the majority of the Unions connected with occupations which are only called trades by courtesy, and others whose councils are inspired by Socialistic ideas rather than the practical concerns of the members. The really useful Unions will remain unaffected; and only those that are essentially lawless will find their opportunities for action—that is, mischief—cut off.

The Singapore Gas Company.

In another part of to-day's issue, will be found a report of the final meeting of shareholders in this Company, whose works are about to pass into the hands of the Municipality. We have on previous occasions referred to the vicissitudes of the Company, whose profits have necessarily been to a very large extent dependent upon the value of silver. In our "Circular to Gas Companies," on March 25, 1862, it was stated that a prospectus had been issued of the Singapore Gas Company, with a capital of £100,000, in shares of £5 each; and the works were first lighted up on May 24, 1864. Since that time the Company have never failed in the fulfilment of the obligations they undertook. As the paid-up ordinary capital of the undertaking amounts to £64,300, and the purchase price has been fixed at £41,420, the return to the proprietors will be less than 60 per cent. of the face-value of the shares; while the average dividend paid has been no more than 4¼ per cent. This is certainly not an adequate return for the risk involved in such an investment; and, in the opinion of the Chairman of the Company (Mr. Samuel Spencer), it should be a warning to all English companies embarking their capital in foreign or colonial undertakings. But though the return to the shareholders will be so small, it was only by the most strenuous exertions of the Directors and officials that an offer of even this sum was obtained for the works; and certainly no more than justice has been done by the proprietors in the way of compensating the latter gentlemen for their loss of office. Those at the head of affairs have striven hard for the welfare of the Company; and, taking all the circumstances into consideration, it must be agreed that they have made the very best of what may assuredly be called a "bad job."

The Humours of a Housing Conference.

It is a curious truth that people often fall into self-contradiction within a very brief period of discussion of a debateable matter, without ever discovering the fact. There has just been held in Birmingham, under the auspices of the Garden City Association, a conference on the problem of housing in great cities and towns. It is unnecessary for us to repeat the assurances of goodwill which we have always extended to the public-spirited founders and supporters of this Association; and we are glad to believe that the delegates to the conference had a good time. On the present occasion, what we desire to point out is the astonishing self-contradiction as to the most hopeful means of carrying out the objects of the Association, into which Mr. Raymond Unwin, a speaker at the opening meeting, fell in supporting a proposal that local authorities ought to be the chief movers in the matter. He had a resolution to move, to this effect, and urged that it is the duty of municipalities to take up the housing question, "as private enterprise had, to some extent, failed, and the "problem had been solved by philanthropists like Messrs. "Cadbury and Messrs. Lever Bros." What a remarkable confusion of thought is revealed in these words! "Private "enterprise" has failed to properly house the people; and yet certain firms have solved the problem. Moreover, these said firms are classified as "philanthropists." This will never do. The modern world is accustomed to the idea of presentation plate and swords of honour "designed" by limited joint-stock companies; but philanthropy by company has hitherto been unthinkable. Is the Millennium to be inaugurated by a business concern with a quotation on the Stock Exchange? Private enterprise cannot be truly said to have failed to provide good housing for working people, so long as Cadburys and Levers endure to show the contrary to be the fact. Then, why this despairing appeal to local authorities? Have municipalities more intellect, or a better will, than these employers and others who might be named? Not a bit of it! The housing problem is too big for local authorities to tackle; but it can be dealt with in detail, if private enterprise is not frightened away by the action of public bodies, or rendered impossible by their often ill-considered rate-aided competition.

Gas-Engines at the Glasgow Exhibition.

Something more than ordinary commercial or technical significance attaches to the circumstance that one of the leading firms of gas-engine makers exhibiting at Glasgow has staged a midget motor of about ¾-horse power effective. After all that has been written and said of late about the big gas-engine, which is to be the motor of the future, whether driven by blast-furnace or by a specially made fuel gas, this persistence in the market of the smallest size of gas-motor is a striking phenomenon. Where is the electric motor of which so much has also been said? Surely, if there is any trade in electric motors at all, it must be in the small sizes, ranging up to 5-horse power, which correspond with the greater number of power machines used in town districts where a supply of electricity is obtainable. Yet, judging from Glasgow, there is not the slightest perceptible

check in the activity of the firms making small gas-motors for the market. They are all as busy as they can well be, including many manufacturers who do not exhibit and are not much given to advertising. While there are one or two gas-engines of large size at Glasgow, it cannot be said that the Exhibition shows in this regard any advance upon Paris, where the great 1000-horse power "Simplex" gas-engine was a feature. Our own opinion upon these facts is only of a piece with what we have frequently advanced in these columns on previous occasions. It has yet to be proved that there is a large market for these big gas-engines, apart from places where iron is made, and where a fuel gas is a waste product. There is, on the other hand, any amount of trade to be done in engines of small to medium sizes; and these are the motors which use the ordinary gas supply.

The lesson of these observations is plain enough for the simplest to read. Every possible encouragement should be given to the users of gas-engines in or near towns, consistent with fairness to other classes of gas consumers. Very often it is a matter of main pressure and capacity, which need altering in view of the fresh demand. Notwithstanding the completeness with which the old dictum about keeping down the day pressures has been exploded, its tradition lingers in many places where one would least expect to find it. The same observation applies to the provision of pipe-connections. Many a good power trade has been nipped at the start because the gas authorities refused to enlarge a main, and persisted in the antiquated practice of doing all their street work during the day, just when gas-engines are most busy. The time when a 2-inch "rider" could keep up the supply for a broken 12-inch gas-main during the day, is past. It might do in the small hours of the morning, but not at busier times.

WATER AFFAIRS.

Low Water.

In the period that has elapsed since we last referred to the serious condition of the water storage in some of the important towns in the Provinces—notably Manchester—there has, unfortunately, been little or no relief of the anxiety which has for some weeks been an ever-present feeling with those who are responsible for maintaining the service. To be called upon to make bricks without straw has been acknowledged from the time of the Egyptians to be an exceedingly difficult task to impose, even upon people in bondage; but to have to keep up a supply of a necessary of life to thousands of human beings with the stores daily diminishing before one's eyes, and with but little prospect of replenishment, is a duty which cannot be borne light-heartedly. To enjoin the consumers to exercise the utmost care in the use of water, is naturally the first step taken in the direction of a conservation of the precious fluid; and, of course, this has been done. The next step is to curtail the supply, obnoxious as that step may be. We are assured, on classical authority, that human beings cannot resist a certain feeling of gratification when contemplating the misfortunes of others. We do not own to possessing any such sentiment. We regret that uncontrollable circumstances should have led to the condition of things recently recorded. At the same time, we cannot repress our gratification that the Metropolitan Water Companies have passed through a trying time without evoking those outbursts of indignation on the part of dissatisfied consumers which are so gladly welcomed by certain newspapers in the dull season.

Abandonment of the Portsmouth Water Scheme.

The adverse criticism passed by the ratepayers of Portsmouth upon the scheme provisionally agreed upon by a Committee of the Town Council and the Directors of the Water Company for the transfer of the undertaking of the latter to the Corporation, has resulted, as briefly recorded in the "Journal" last week, in the abandonment of the project by the Water Committee. The formal resolution embodying their decision came before the Council at their last meeting, when an amendment to refer the matter back was defeated by 19 votes to 8, and the course suggested by the Committee was followed. The history of this question extends over a period bordering upon half-a-century. But now, to borrow the happy phraseology of a writer in a local paper, "the last chapter has been written, "and the book closed"—never, it may be presumed, to be opened again; for the prime mover in reviving the proposal described the present as the Corporation's "last "chance." Have the inhabitants of Portsmouth lost anything by the chance being allowed to slip? We conscientiously believe they have not. Though the Chairman of the Committee (Mr. H. Rufus Pink, J.P.) still holds the opinion that if the works had been acquired at the price agreed upon—viz., £1,250,000—and carefully managed, the water undertaking would, in the course of years, not only have been a paying concern, but would have yielded a surplus, he naturally regarded the matter from the most favourable standpoint financially; and possibly a little sentiment prompted him and his supporters—a desire to have the supply of water under municipal control. Not, as he confessed, that the Corporation had the slightest grievance against the Company, or that the consumers had to submit to an intermittent service; but solely to get control of the roads, and put the supply of water under the supervision of the Health Department. He does not appear to attach much importance to the resolutions passed at the ratepayers' meetings. He has not very great regard for "the voice of "the people" on this question. But he must not forget that there was published a very significant statement of an "Expert Water Engineer" antagonistic to the purchase on the terms proposed. With the prospect of a rate-in-aid of nearly £15,000, which he pointed out would be the result of closing the bargain on those terms, it is scarcely to be wondered at that the ratepayers should have declined to incur the burden. In bowing to their decision, the Committee have been charged with "showing the white feather." But if the town had been polled, we think the result would only have been a more pronounced condemnation of the proposal. The whole incident is an interesting one, as it shows that there are ratepayers who are not so captivated by Municipalism as to clamour for its adoption in circumstances which they believe will add to, rather than lighten, their financial burdens, without rendering more efficient the service taken over. The result may well be borne in mind elsewhere. It is possible to buy gold too dearly.

The Surplus Water Revenue at Sheffield.

It would be seen by the report which appeared in last week's issue of the "Journal" that the Sheffield Town Council have now a clear indication of the views of the Water Committee as to the best means of using their surplus revenue, in regard to which the Chairman (Alderman Gainsford) recently addressed to them a very suggestive letter, which was noticed in our columns at the time. There is a sum of £9500 which may be disposed of annually; and of this it is estimated by the Committee and General Manager (Mr. W. Terrey) that from £5000 to £6000 may be safely dealt with. The opinion of the Committee, as expressed by their Chairman, is that it will be useless to employ this money, which is made up of a number of small contributions that are not felt by anyone, in the relief of the rates, but to use it in so relieving the charges for water that the greatest good may be done to the greatest number. One suggestion offered was that, as the amenities of the Lady Bower Valley were being disturbed in the interests of the water undertaking, the available surplus might well be employed in purchasing that ravine for the use of Sheffield for ever. Another was that something in the way of municipal old-age pensions should be established. But the Committee, very properly as we think, declined to entertain either of them. The money comes from the water consumers, and they should be first considered in its disposition. The decision arrived at by the Committee was that there should be a reduction in the charges for baths, and that the water-closet system should be extended so as to make greater cleanliness possible to the working classes, without entailing upon them any additional expense. Concisely put, this is the scheme proposed by the Committee, the details of which will be laid before the Council in due course. It was received with general approval; the few critical observations made being fully answered by Alderman Gainsford. But, unfortunately, there exists some legal obstacle in the way of carrying it out; though doubtless this will be overcome between now and March next year, before which date no change can be made. We again congratulate Sheffield on the successful management of its water undertaking, which has placed this surplus at the disposal of the Water Committee, and commend the latter and their able Chairman for the thoughtful and appropriate suggestions they have offered in regard to utilizing it to the greatest advantage.

THE CONSTRUCTION OF INCLINED RETORT CARBONIZING PLANTS.

By WALTER RALPH HERRING, M.Inst.C.E., Edinburgh.

[A Paper read before the Gas Section of the Engineering Congress at Glasgow.]

The subject which the author has the honour of bringing before the attention of this Section of the International Engineering Congress, is one that may be said to be familiar to all, and needs neither introduction nor much time being spent upon the elementary definitions of the purposes and objects sought to be achieved, and how best to accomplish the same. These aspects of the question have been somewhat fully dealt with by the author on former occasions—once in the paper which he read before the Royal Scottish Society of Arts in March, 1900,* and again in the paper which he read at the annual meeting of the North British Association of Gas Managers in July the same year.†

The primary object of the process is the reduction to a minimum of the labour hitherto involved in the charging and drawing of coal-gas retorts, by employing simple and reliable mechanical devices for manipulating the material to be dealt with, and by taking the fullest advantage of the natural force of gravity to charge and draw the retorts when set upon a plane inclined to the horizontal line. There are other secondary advantages—such as the greater producing capacity over a given area of land, and economy in construction, &c., &c. But as these questions are influenced by local circumstances and the individuality of the designer, they may, for this occasion, be set aside, and the question be considered broadly with a view of settling the doubts which even to-day are openly expressed as to the unsuitability of the system when certain classes of coal have to be dealt with. The gathering together of men from all parts of the world at this Congress appeared to the author to be an excellent opportunity for gleaning the opinions of engineers on this particular point, seeing that so many of our Continental *confrères* use the same coal as ourselves, and such as is alleged to be unsuitable by some in our own country, but which, as far as the author has been able to judge from observations of the Continental installations, appears to work in a most satisfactory manner abroad.

Considerable variety is shown in the outward form of the different plants existing in this country, as contrasted with the various installations upon the Continent of Europe. A great uniformity is discernable in the Continental installations, owing probably to the fact that, with few exceptions, the plants have been erected by the same constructors. The author is not prepared to suggest that this has not been generally advantageous to all parties. The Continental constructors in the first instance had the advantages of the earlier experience of the various installations that were erected in this country, and were able to avoid the defects which had manifested themselves in many of the English plants—so much so, in fact, that it would be difficult to find a plant on the Continent that is not working equally as satisfactorily as the best English designs, and working, be it remembered, with the very same coal as is alleged by some English engineers to "creep" and slide to the lower end of the retorts, and thus be impossible of being utilized in inclined retorts.

Another distinctive feature of Continental installations is the length of the retort. The British practice may be said to be 20-feet retorts, where space permits of their adoption; whereas on the Continent from 3 to 3½ metres (10 feet to 11ft. 6in.) is the predominant length of the retort. The only installation in this country, of which the author has any knowledge approaching the Continental length, is one which was erected at Leigh, in Lancashire, where 12ft. 6in. retorts were put in. This bench, however, was levelled to the ground, and reconstructed as 20-feet retorts, some few years after its first introduction.

The author, in his erections at Huddersfield, put in 15-feet retorts; the available space not permitting of anything longer. The fact of the majority of the British installations being 20 feet, is, however, in the author's opinion, sufficient to prove that there can be no doubt as to their efficacy, and also their utility. There certainly cannot be any question as to their economy, both from a constructional and also from a manufacturing costs point of view. The one producer, the one set of mouthpieces, pipes, hydraulic mains, &c., are required for the shorter, the same as for the longer retorts.

The increased capacity of the hoppers necessitates but a small percentage in the additional weight of their structure; and from a labour point of view, the operation of charging a 20-feet retort with 7 cwt. of coal is no greater, and occupies but a few seconds more, than the charging of a retort from 12 ft. 6 in. to 13 feet long. Under the circumstances, therefore, it will be highly interesting if our Continental friends will disclose to us their reasons for adhering to the shorter retorts.

The inclined retort installations at the present time may, broadly speaking, be defined as consisting of two distinct types, with considerable variety of outward form, and yet similarity of design so far as the details of the various parts common to each are concerned.

The best known type is that having continuous coal-storage hoppers (subdivided or not) erected above the benches, with or without measuring chambers beneath, but more commonly with the measuring chamber attached to the underside of the storage hopper.

The other distinctive type has one or more coal storage hoppers centralized; the charging shoot forming also the measuring chamber, receiving its charge from beneath the hopper, and traversing with it to the retorts to be charged. The author throughout has been a staunch advocate for the continuous storage hopper, with or without the measuring chamber beneath; his reasons being that one must, in the first instance, mechanically handle the coal, in order to get it to the required elevation for charging the retorts by gravity. As this is a necessity, it is as easy to deposit the coal in exactly the position required for charging the individual retorts, by distributing it in a long continuous hopper running the entire length of the bench, as to deposit it in a large hopper localized, but not necessarily running the whole length of the bench. The latter necessitates the employment of additional labour to transfer the coal from the storage hopper to the particular retorts to be charged. There is also considerable loss of time in handling the charging appliances, as the charger has to carry the charge a certain distance in the retort-house; whereas in the former case the coal is immediately above the retort to be charged, and the charger has simply to direct the current into the retort. The same weight of coal must be stored in either system; and the greater the bulk stored over a given area, the greater strength is required in the construction of the hopper and its supporting structure. Continuous hoppers need not be more than ¼ inch thick, properly stayed, extending continuously for the length of the retort-bench, with the measuring chambers suspended beneath them.

With this system, the coal, which must in the first instance be handled mechanically, is delivered at the very point where it is required to be used; and no further handling of the material takes place. With the other type, the coal is, in the first instance, handled mechanically, and discharged into the storage hopper wherever it may be. From this point, it is traversed by hand to the particular retorts into which it is to be charged. No argument in the world can convince one that this can be done as cheaply as with the coal lying immediately above the retort to be charged. In the first type mentioned, the coal is conducted to the retort by means of a lightly constructed shoot traversing upon rails suspended from above; and by means of the various checking devices, the stream of coal is fed into the retort. In the second type, the charging shoot must be constructed sufficiently strong to carry the weight of the charge in addition to itself, and permit of its being traversed; the tramway above being also more strongly constructed to carry the additional weight. In the one case, the charging shoot receives the charge, and is traversed along a more or less lengthened distance of the retort-bench face by hand labour; while in the other, the charging shoot merely conducts and directs the coal into the retort to be charged. There are, perhaps, other modifications of these two types—such as the displacement of the measuring chamber by having the conducting shoot sufficiently large to contain the necessary weight for one charge. This, of necessity, is somewhat heavier, but insignificantly so as compared with the charger which also carries and traverses its load. These, however, are insufficiently defined to require consideration at this stage.

The author has always been somewhat puzzled to know what train of reasoning brought into existence the central storage hopper as distinct from the continuous hopper system.

* See "JOURNAL," Vol. LXXV., p. 865. † *Ibid.*, Vol. LXXVI., p. 348.

As regards structural cost, it is certainly no cheaper, if as cheap; and (as already shown) it cannot be as economical in the daily operations to be performed. Its advocates, it is to be hoped, will take advantage of the present occasion to give the gas industry the benefit of their reasons for adopting the system.

The charging appliances, or the means used for conducting the coal into the mouth of the retort, have a most important influence upon the successful working of the system. The many varieties of coal that have to be dealt with—from fine dust, wet and dry, to mixed coal, and on to round nuts—has brought into existence all sorts of devices whereby the charge can be regulated so as to flow into the retorts at a uniform and even speed, and ensure a perfectly level and uniform charge throughout the length of the retort.

There are in these also distinctive features illustrative of either of the two types of plant previously referred to. Generally speaking, in the case of Type A—viz., the continuous hopper system—the coal is allowed to drop from the base of the measuring chamber, and is checked in its descent by the adjustable sloping valves or balanced flaps within the charging shoot. The traversing charging shoot working in conjunction with the centralized hopper, or Type B, has first to be charged from the hopper and then to carry its charge to the retort, where it discharges from its base on to the mouth of the retort; the base of the shoot being set approximately at the angle at which the retorts are set, a valve being opened, and the coal, by its natural inclination, sliding into the retort. Again, bearing in mind the many varying classes of coal with which we have to deal, it has always appeared to the author that this charging appliance is deficient in positive force. The coal receives its impetus from its natural tendency to slide from the sloping base of the shoot—an angle which is unalterable; the coal, as a matter of fact, sliding on itself in its effort to pass through the valve-opening. It will be agreed that the coal, having differing physical characteristics, will act differently under these fixed circumstances of angle of discharge; and as there is no positive power in existence with this appliance, it is not surprising that it is now being regarded as of doubtful utility simply as a charging appliance. But assume, for instance, the worst case possible (which is the proper way of looking at these points), and that the shoot has been filled from the overhead hopper with a charge of fine, wet slack. If the angle of the base is suitable for ordinary coal, it must fail under such conditions to act efficiently. No doubt, the average class of coal can be made to work fairly satisfactorily with it; but there is a wide range in the physical characteristics of clean nut coal and the class previously mentioned. For these reasons, therefore, the author has always preferred to retain within his reach, figuratively speaking, the power of sending the charge of coal direct into the retort and over the bottom mouthpiece-stop, and adopt means to govern the impetus of the coal, by simple devices, to suit all the various conditions of the physical characteristics of the coal, to ensure a uniform charge.

To accomplish this, the author found it necessary, in the first instance, to have some control of the aperture or the area of the point of discharge of the coal from the measuring chamber; in other words, that the total charge should pass out of the measuring chamber in a given time irrespective of the character of the coal itself. By inserting a sliding valve in the base of the measuring chamber, the area can be governed at will. It will be admitted—assuming the principle to be right, that the coal should discharge from the chamber in a given time—that the nut coal will require a smaller area to discharge itself within that time than a charge of small and damp slack. Between these grades, various degrees exist. This valve was first inserted into the measuring chambers of the second installation at Huddersfield, and was found to be of very great service indeed; the regulation of it being operated from the top of the retort-bench, and in the hands of the stage foreman only.

It may perhaps be remarked that the author has never been one of those fortunate individuals who have had but one or two classes of coal to deal with. During his ten years' experience with inclined retorts, he has never had less than eleven descriptions of coal being delivered at one and the same time; these proportions varying to as many as seventeen to eighteen different classes. So it must be admitted that his remarks are founded upon a general experience with many classes of coal, confirmed by lengthy experiments with one coal over extended periods in experimental settings. The author thinks it necessary to make this statement at the present stage, in order that no misunderstanding may arise as to his opinions being founded on other than practical experience.

Reverting now to the charger used in conjunction with Type A, its primary purpose is to conduct the coal from the chamber to the retort. Mounted upon a light carriage, it is made to run along a light overhead railway, and must be fitted with an adjustable shoe-piece that can be moved in and out of the retort mouthpieces, moving either horizontally in and out or by raising and lowering the outer end sufficiently to permit of the lip clearing the mouthpieces and buckstays. Separate chargers are employed for each horizontal row of retorts. There is no virtue in this, beyond practical utility. Each row of retorts being on a different level necessitates a longer body to each, and consequently a longer drop for the coal, with its accelerated impetus. This impetus must be governed; and many devices have been introduced to accomplish it, most of which are successful so long as a minor degree of intelligence is exercised in their employment. They must, however, be regulated to suit the physical characteristics of coal coming to hand from time to time; and this is best left to one man to do. The most successful device is the compound flap hinged within the body of the shoot, and adjusted by levers from the outside, set at such an angle as to check the impetus by thinning the stream of descending coal and directing it into a uniform layer upon the base of the shoe of the charger. Any interference with this flow within the shoe is fatal to good charging. For the longest shoot, more than one set of hinged checks is advisable. In all cases, however, their proportions must be such as to prevent the area of the body of the shoot being reduced to such an extent as to choke the passage way. The body should be as wide as the retort will permit, and rectangular in section, so as draw the coal into a stream similar to the form it is to take in the retort.

The author recently thought it would be advantageous to have the means of altering the angle of the shoe-piece of the shoot. With the original installations, this was accomplished by telescopic arrangements, attached to the body of the shoot, raising and lowering a hinged shoe. This class of shoot gave very considerable trouble, not in consequence of the angle of the shoe being adjustable, but because of the means that were adopted to make it so, and the power required to put the shoe into the lip of the mouthpiece; the whole shoe being hinged, and requiring very considerable labour to lift it and place the lip upon the mouthpiece of the retort. The charger was, therefore, generally speaking, abandoned for those having a traversing shoe-piece, so as to run in and out of the mouthpiece. This, however, necessitates the employment of a fixed angle for the shoe, which, from experience, the author is prepared to say is wrong; and, in order to overcome it, he has introduced a means of adjusting this angle of the shoe, which will be illustrated and referred to when describing the latest installation at Edinburgh.

Up to this stage, the introduction of the inclined retort may be said to have accomplished a very great deal in the economy of gas manufacture; but from this point, the author does not claim that much economy is brought about, except perhaps in the physical force exerted by the operatives.

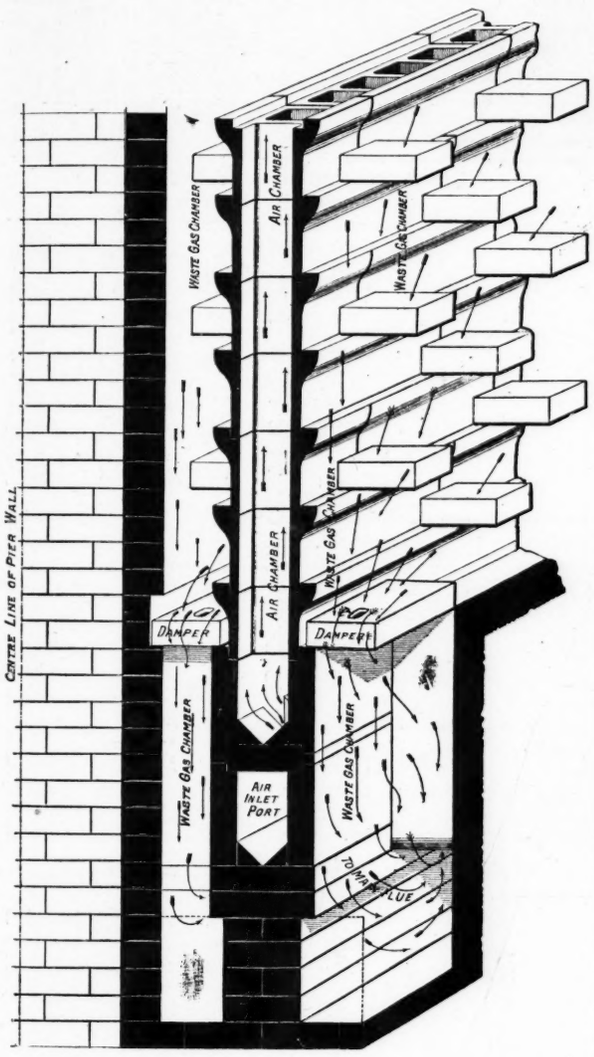
The discharging of the coke from the retorts cannot claim to be automatic. With new retorts it is sometimes so, but cannot be relied upon to a greater degree than 50 per cent.; and although the discharging by manual labour is comparatively easy, the expenditure is the same as though the men were being hard worked.

Taper retorts were introduced to overcome this defect; but from experience with both tapered and parallel retorts, the author is not able to appreciate the advantages of taper retorts sufficiently to warrant his again introducing them elsewhere. The taper retorts also interfere with the uniform area of the heat-passages in the retort-setting, as well as reducing by nearly 10 per cent. the carbonizing area of the setting. In the author's opinion, the shape, or cross section, of the retort has far more to do with the question of automatic discharging than its parallel form.

In a paper contributed to the North British Association meeting in July, 1900, the author dealt very fully with this matter; and he is of opinion that the cross section of the retort should be of such a form as to permit of the expansion of the coal in the retort rising without jamming itself into the arch or crown of the retort, and that this formation must be continued to the outer lip of the cast-iron mouth-

piece. With such a form, the process will become as near automatic as it is possible to have it without introducing additional mechanical devices.

This, however, can easily be done; and the author is making preparations for it in the Granton erections by having a hydraulic, or compressed-air, piston working in and out of the retort from the upper side, arranged with an accelerating motion so that the piston-head will, upon entering the retort, start very slowly and gradually increase in speed, descending from 8 to 10 feet into the retort—thus giving the charge the necessary impulse to traverse down the slope of the retort. When once set in motion, there is not much chance of it again coming to a state of repose. This appliance is to be mounted upon a light traversing carriage, arranged with raising and lowering devices, so that one cylinder can be raised and lowered to serve the three rows of retorts.



Perspective View of the Regenerative Chambers.

The manipulation of the slides of the measuring chambers, or the valve at the base of the storage hopper, necessitates a very great amount of physical force to ensure their uniform and regular working, as well as requiring considerable structional additions to carry the levers, frames, and shafts associated therewith. The author has endeavoured to not only simplify this structurally, but also to minimize the physical exertion demanded from the operatives. This he has accomplished by introducing a small double-acting hydraulic cylinder and piston bolted to the underside of the coal storage hopper, and attached to the sliding valves governing the discharge openings from the hopper. And in the case of measuring chambers, the usual single lever is introducd to actuate the bottom slide. The diagrams on the wall are sufficiently clear to illustrate the general arrangements of the structure for the application of these cylinders for the purposes in view. A simple multiple hydraulic valve is fixed on the stage of the retort-bench, and made to work groups of cylinders, in the case of the two retort-settings at New Street works, Edinburgh. One multiple valve is made to work six cylinders actuating six measuring chambers. It is the author's intention, however, to group them into sets of twelve. A single stroke of the lever permits of the operation of one chamber discharging, and the reversal of the lever again closing the valve of the chamber and the hopper. The whole operation requires no more exertion than can be exercised by a child. It will be seen from the diagram that considerable simplification of the structure is rendered possible by these arrangements, as compared with the hand-worked system; and I may say that the hydraulic cylinders, with their valves and accessories, are less costly per retort than the arrangements hitherto employed.

The author also desires to draw attention to the fact that the coal storage hopper is made to carry itself, instead of being supported, upon longitudinal girders and angle irons spanning the space between the transverse ties attached to the inner buckstay heads; the cross section of the hopper shown on the diagram being the same throughout its entire length. The measuring chambers are bolted to, and suspended from, the base of the hopper, instead of being supported upon two channel-irons, which received their supports from the transverse girders that formerly carried the framework for supporting the hand-lever arrangements.

The accumulation of tar and other condensable matters in the lip of the lower mouthpieces—brought about, in the author's opinion, from the long length of the front ascension-pipes condensing the vapours ascending with the gas—often renders the drawing-stage mouthpieces a most unsightly spectacle, as well as involving considerable labour in the cleaning of the mouthpieces, levers, and mechanical parts. This condensation, no doubt, greatly assists in keeping the pipes clear; but to overcome the annoyance, the author is introducing a traversing screen, resting upon light rails bracketed to the front buckstays, each screen being sufficiently long to span the length of three retorts, and direct the coke and tar, and anything falling from the mouthpieces, directly into the shoot conducting the coke into the coke-conveyor trough.

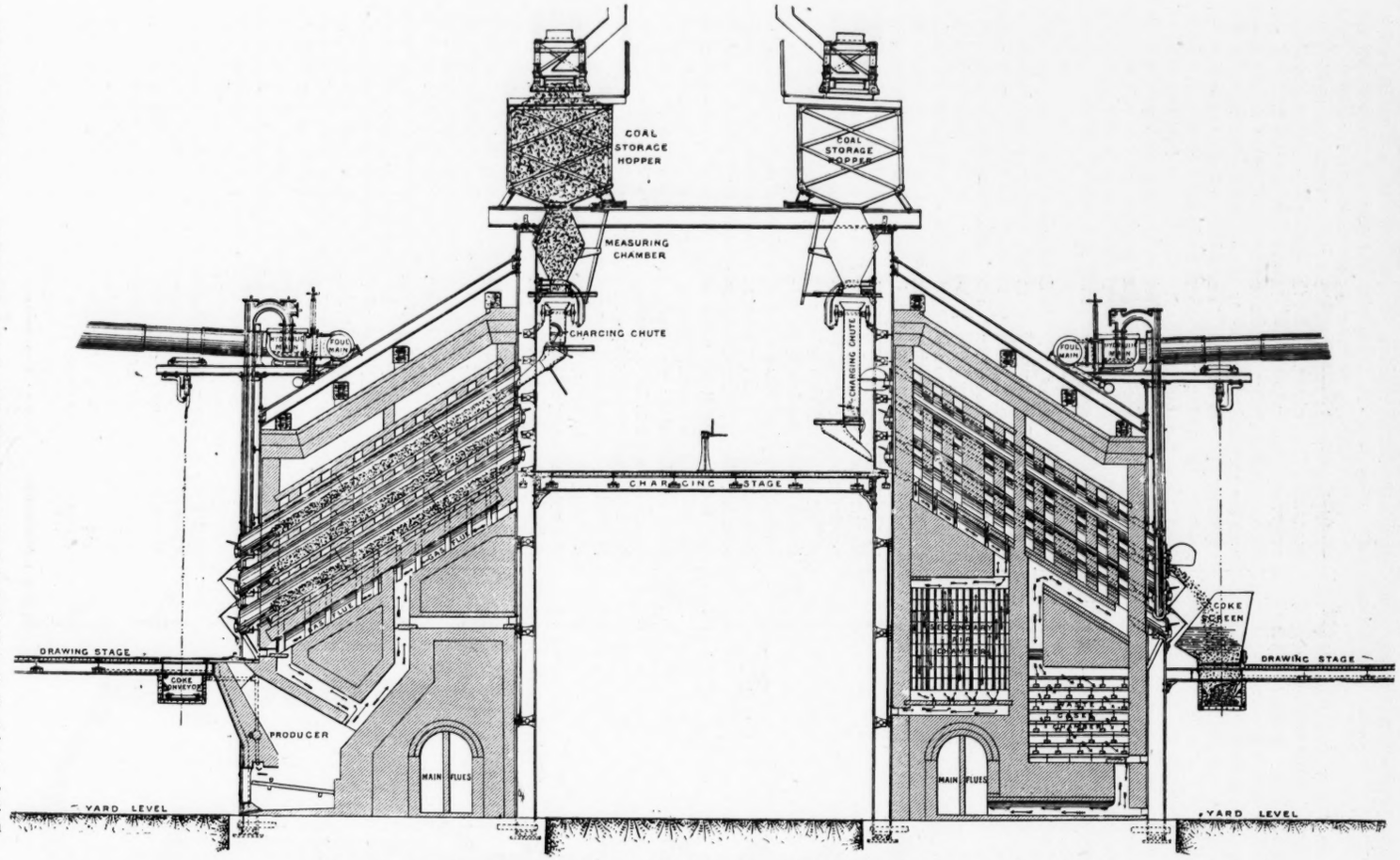
The great improvements that have been made recently in the construction of conveyors for the transportation of hot coke, render it now possible to introduce these appliances for the removal of the coke from the retort-house as it is discharged from the retort-mouthpieces; the trough being placed preferably beneath the floor, and arrangements made therein for the quenching of the coke and the withdrawal of the foul gases and steam through a duct, and discharging them above the retort-bench level. Considerable disappointment was occasioned upon the original introduction of these appliances in many works. This, the author thinks, arose primarily from the want of a sufficiency of substance and the employment of proper metals in the parts composing the conveyor—many of these constructions being more of a tinsmith's job than a piece of engineering work. Experience, however, proved the necessity of very substantial work. Suppliers of these conveyors have risen to the occasion; and there are now one or two really first-class appliances of this character on the market, and such as can be depended upon doing their work with a minimum of wear and tear and a very great degree of reliability.

The author prefers the cast-iron trough and roller-chain type of conveyor; the trough suspended beneath the floor joists being entirely covered in on the drawing-stage level, with portable covers for opening immediately in front of the retorts to be drawn—perforated pipes being fitted within the trough, and a tap regulating a section in front of each retort-setting. Coke, on being drawn from a given setting, meets with the water when it comes opposite the next but one setting. By this means, the steam and products emitted during the quenching of the coke are drawn through the conveyor trough forming its own duct, and up vertical shafts at the ends of the bench. The traversing screen or shield should be used in front of the retorts to protect the men from the direct heat-rays of the discharging coke. It also acts as a shoot to direct the stream of coke to the aperture leading to the coke conveyor beneath.

The improvements in the construction of coke conveyors render it possible to abandon the stage-floor retort-house altogether; having the producer on the inner side, or preferably self-contained gas-producers situated at a convenient point for feeding with coke, and the conducting of the fuel

gas to the retort-setting through brick-lined conduits. This opens a very large field for economy in construction; and although the self-contained producer has been tried in many instances without any striking success, the author is of opinion that there can be no doubt of its ultimate adoption in the heating of coal-gas retorts, the same as it is used in many other industries.

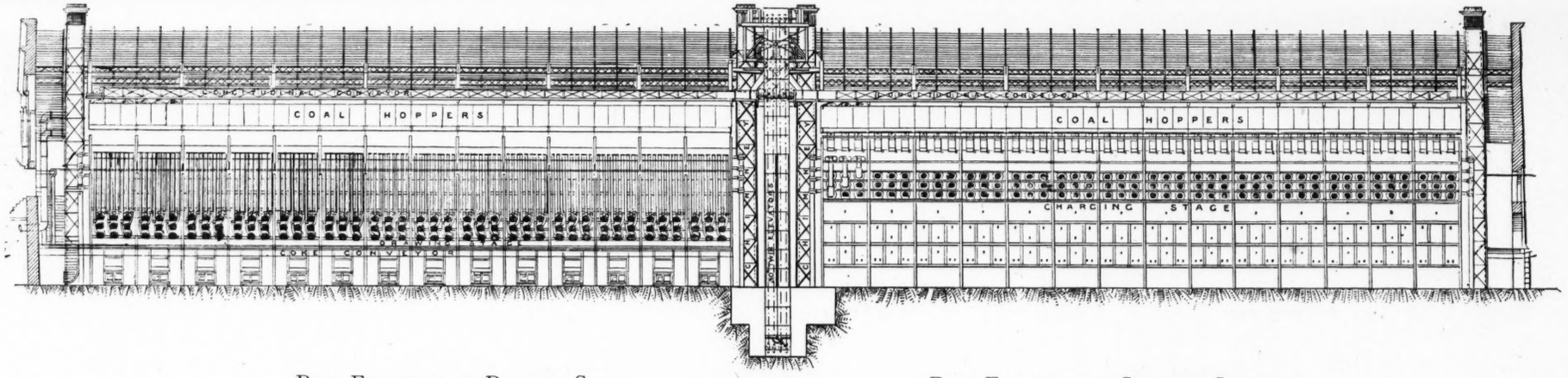
Time will not permit of any elaborate description of the work now approaching completion at the new Edinburgh Gas-Works. The plant has been designed to carbonize 1000 tons of coal per 24 hours, and consists of 504 20-feet retorts, 22½ inches wide by 15¼ inches deep, in cross sections, set in settings of nines, and divided into four complete benches, each bench having two short chimneys, one at either end. The width of the charging stage is 25 feet; and that of the drawing stage 24 feet. The height of the drawing stage from the yard level is 10 ft. 6 in. Each setting of nine retorts is fitted with a self-contained hydraulic main, with an adjustable seal-valve, which insures a liquor seal; the gas passing forward to the foul main. The condensable matter at once descends into a tar-pipe; one connection being placed immediately at the back of each hydraulic main. The gas, after leaving the foul main, passes through a sevenfold coil of 22-inch pipes, arranged within the haunch of the circular girder roof; the pipes having an inclination in the direction of the retort-bench, so that all condensable matters settling in these mains flow in the reverse direction to the stream of gas.



CROSS SECTION OF THE NEW RETORT-HOUSE AT GRANTON.

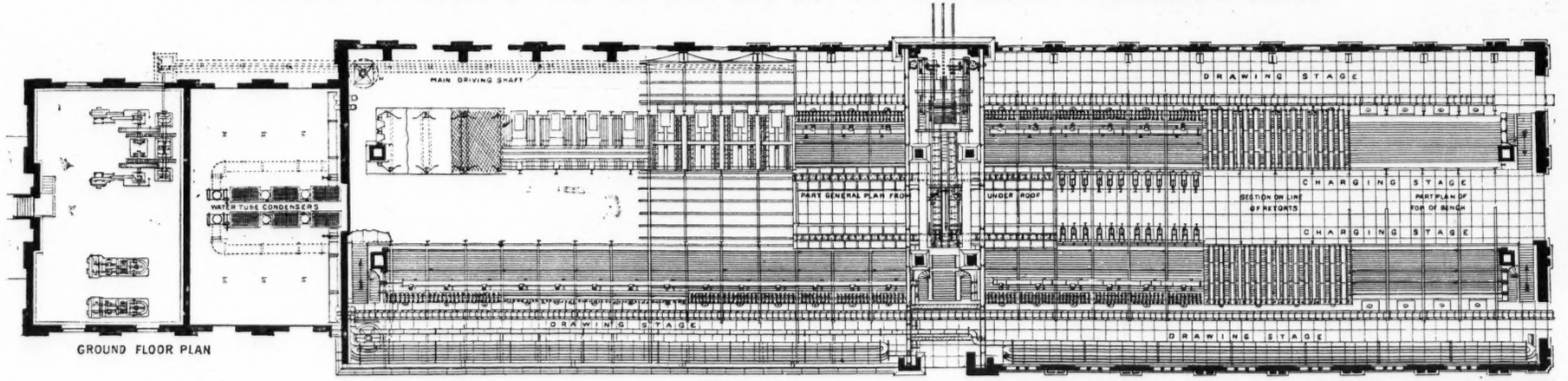
The division-walls between the settings are 12 feet centres, and 2 feet thick, with panels formed therein. By doing this, a larger space is secured for the circulating flues; and at the same time the substance of the 2-feet division-wall is maintained. The form of producer will be clearly seen on reference to Diagram No. 1. The design is such as to insure the removal of the fuel gas from a point below the average surface of the fuel-bed, thus securing a seal for the exit-port; so that any air finding access through the producer charging-door, as well as tarry coke vapour, must first pass through the fuel-bed and become converted into gas. This insures a uniform quality of fuel gas going forward to the setting, and also avoids local combustion in the producer itself. The producer-base at the fire-bar level measures 3 ft. by 4 ft. 3 in. long. The gas is conducted to the setting by two distinct channels—one for the lower, and one for the upper half; each conduit being governed by a damper so as to regulate the flow of gas to either half of the setting. The gas-ports discharge at a point level with the inside of the bottom retorts and are spaced so as to discharge between the division-walls of the setting; the air-ports being arranged to discharge under the opening in the division-wall. The sides of the retorts in this portion of the chamber are shielded with silica tiles; the width of the combustion chamber being 10 inches. The co-mingling of the gas and air really takes place on a line a little above the centre of the bottom retorts, and rising into the larger area over the sloping sides. The discharge of the secondary air immediately underneath the division-wall also tends to protect this portion of the setting from the cutting action of the flame.

The settings are constructed of specially-formed blocks



PART ELEVATION OF DRAWING STAGE. PART ELEVATION OF CHARGING STAGE.

GENERAL ELEVATION OF THE 1000 TONS PER DAY INCLINED-RETORT CARBONIZING PLANT.

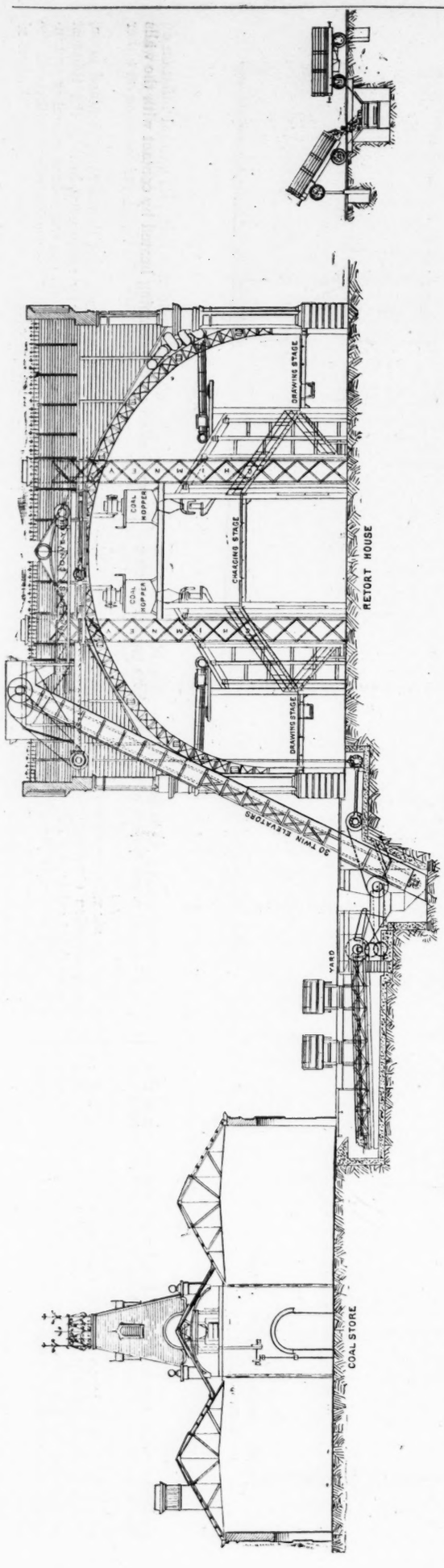


PLAN OF THE 1000 TONS PER DAY INCLINED-RETORT CARBONIZING PLANT.

up to the point approximately level with the crown of the two lower rows of retorts. Above this position, bricks are used. Above the top line of retorts a complete covering of tiles is laid, in order to preserve a uniform area in the heat-channels throughout the settings, and thus prevent the loss of draught by the gas having free play in the large area above the retorts and beneath the crown of the arch in the setting.

Special attention should perhaps be called to the design of the regenerative chambers; the author believing that these possess some degree of novelty. The primary factor kept in view has been to accomplish the heating of the secondary air with a minimum of resistance to its inflow to the combustion chamber of the setting. Bearing in mind the fact that settings of this class are worked at little more than level gauge, it is useless to expect that incoming air can be drawn through circuitous passages to the combustion chamber when there is no suction in the setting to induce its flow; the only force available being its natural inflation on rarifaction on its becoming heated by contact with the walls dividing this chamber from the waste-gas passages on either side.

A special form of block was therefore determined upon, which could be made by machinery, having the thinnest possible substance between the waste-heat chamber and incoming air, and yet of sufficient substance to withstand the thrusts and strains put upon it. This is clearly illustrated



TRANSVERSE SECTIONAL ELEVATION OF COAL-STORE AND RETORT-HOUSE.

by the diagram; the thickness of the fire-clay material between the waste-flues and the air-chamber being $1\frac{1}{2}$ inches, and the transverse partitions being from $\frac{3}{4}$ to 1 inch in thickness. From careful observation and experience, it is found that the expansion and contraction of the work in use causes the transverse ribs of these special blocks to crack in preference to the thicker size; and thus the purpose of the ribs is still efficiently maintained. In other words, the block is so designed that the weaker portions should break first when subjected to undue strain; and when this weaker part is broken, it merely permits fresh air passing through the fracture into the air-passages, while the dividing partition between the waste gas and air remains intact. The waste-heat chambers likewise offer a minimum of resistance to the flow of the waste gases to the main flues. The regenerative blocks are formed with a flange, upon which ordinary fire-bricks are placed to stay the regenerative chambers, and to act as struts to withstand the thrust from the producer walls. They also act as conductors and reservoirs for the heat.

The general construction of the regenerator is clearly defined upon the perspective elevation shown on the diagram. There is nothing experimental about this furnace, nor the setting now in course of construction at Granton; two furnaces and settings having been erected at the New Street station, and worked for some considerable time now.

From Oct. 29 last to March 31 of the present year, the fuel account for this furnace averaged 13·35 lbs. of coke per 100 lbs. of coal carbonized; the lowest week's record being 12·12 lbs., and the highest 14 lbs.

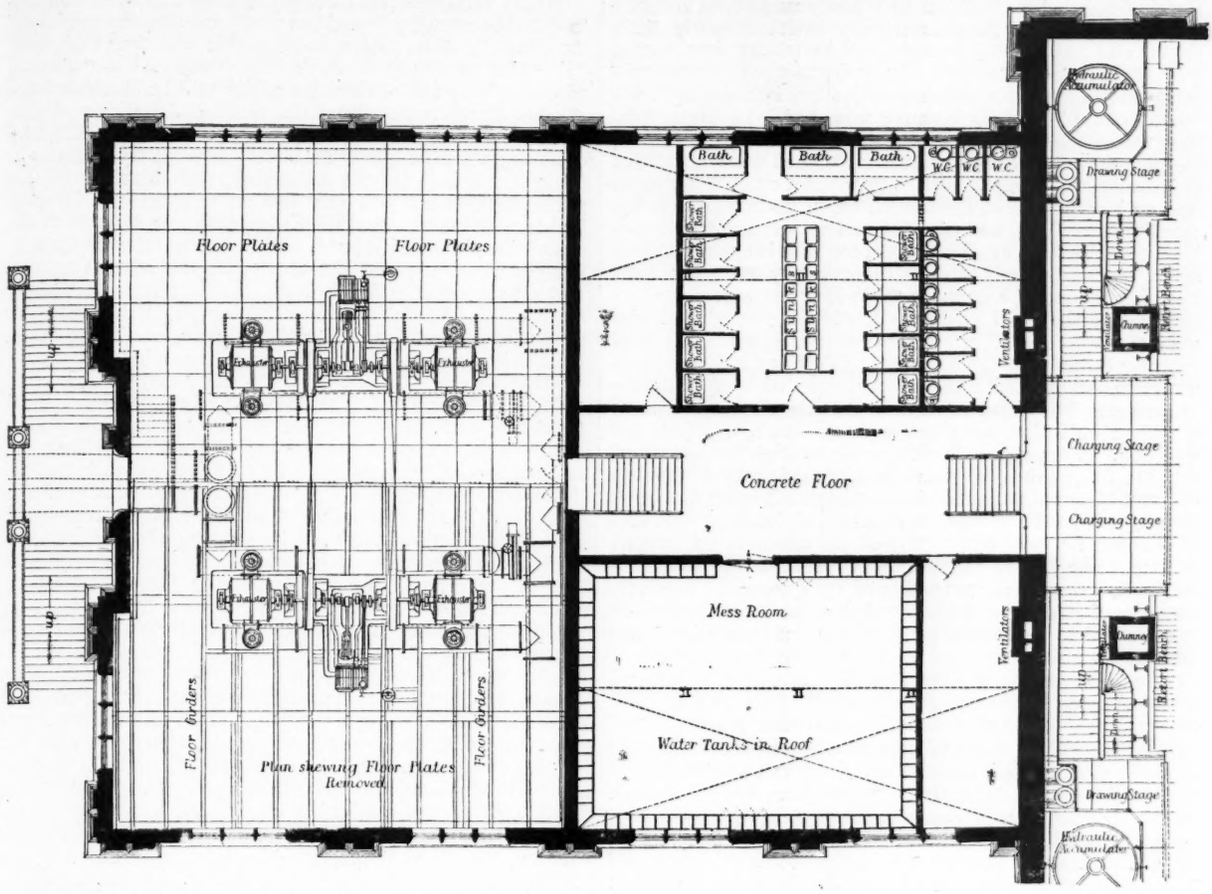
The average weight of the charge of coal per retort was 7 cwt. 9 lbs.; the heaviest week's average, 7 cwt. 1 qr. 27 lbs.; the lightest, 6 cwt. 3 qrs. 4 lbs. The coal used during this period was mostly of a slightly caking character; but it also included proportions of cannel and shale and highly caking coals and nuts. The duration of the charge is four hours, so that each retort carbonized 42 cwt. every 24 hours.

The front of the producer projects beyond the retort-bench, to permit of the charging-door being placed in such a position as to make the feeding of the producer as nearly automatic as possible. This projecting front is stayed by means of two 6 in. by 6 in. by $\frac{1}{2}$ in. angle-irons sloping outwards, and attached at the upper ends to the stage-joists; the lower ends being embedded in the concrete. The clinkering doors and frame are attached to these angle-irons, and have a clear opening of 3 ft. 5 in. by 2 ft. 3 in. Above the clinkering door, and upon the sloping portions of the angle-irons, a $\frac{1}{4}$-inch plate is riveted, within which the producer brickwork is built.

The producer has a grate-bar area of 12 feet. The width over all on the face of the projecting portion of the producer is 5 ft. 6 in. This arrangement makes a very neat producer front, as well as a very strong one; it also forms a capital strut for the regenerative chamber on either side.

The importance of properly bracing the fronts of an inclined retort-setting is fully appreciated by all, and may be said to be incapable of being overdone. The wisdom or necessity of bracing the upper front of the setting on the charging end in an equally efficient manner, may be justly questioned. It is useless to attempt to prevent the linear expansion of the retorts; our object should be to restrain and direct this inevitable lengthening into lines where its effect will be of no disadvantage. In the Granton settings, therefore, the author has abandoned all cross-bracing on the upper face of the settings.

The arrangements for the disposal of the coke in the coke-yard consist of a superstructure containing coke-bunkers erected outside the retort-house. The hot-coke conveyors are made to rise at an angle of about 30°, discharging the coke on to a conveyor running over the top of the coke-bunkers, or directly over screens for loading railway waggons, in which case the breeze is directed to a bunker beneath the screens, and discharged into trucks on a narrow-gauge railway which convey the material to the briquette-making plant. Railways are laid on either side of the coke-bunkers; and by means of shoots the trucks can be filled at will. No elaborate provision has been made for the storing of coke in the open yard, excepting the provision of a narrow-gauge railway, engine, and trucks; the trucks being filled from the coke-bunkers. It is proposed to run them up an inclined plane—the coke itself forming the base. The production of more or less breeze is quite immaterial to our commercial interests, as the manufacture of briquette fuel renders it



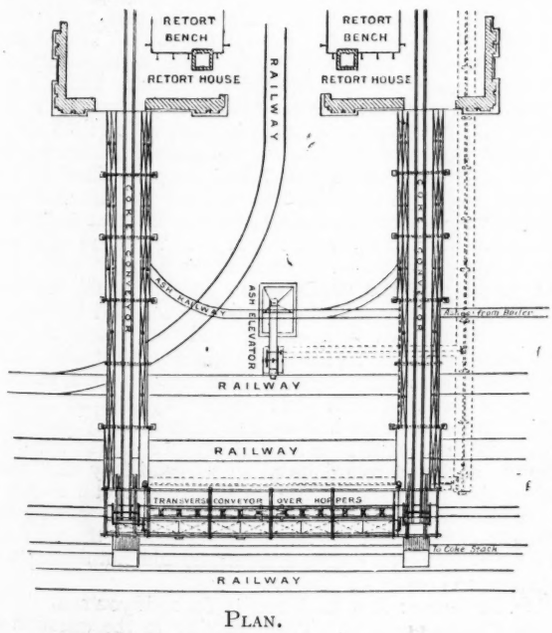
FIRST-FLOOR PLAN OF EXHAUSTER HOUSE, BATH ROOMS, AND MESS ROOMS.

almost possible to grind up the coke for the purpose. The ashes are removed from the producers by means of trucks running on a narrow-gauge railway and discharging at the end of the retort-house, from which point the ashes are elevated and discharged into waggons for transportation.

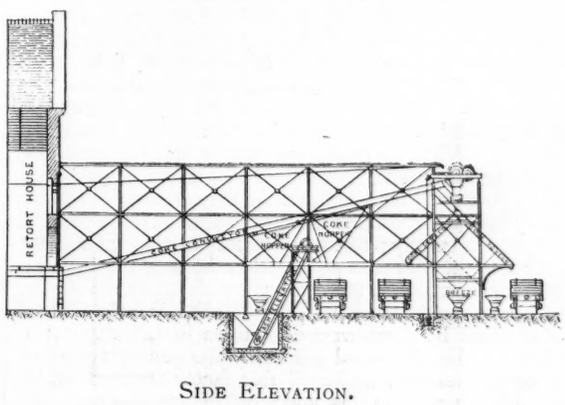
Discussion.

Mr. FOULIS, in inviting discussion, said this was another interesting paper, with a great deal of information in it. He thought probably some of their friends from abroad would be able to inform them as to what was being done there.

Dr. LEYBOLD (Hamburg) said the author told them that he used inclined retorts 20 feet in length. In Germany, they invariably used retorts of half that length—viz., 3½ metres, and seldom 4 metres. With German coal, they got very good results. They gasified the coal in a very short time. With 165 kilogrammes of coal, the carbonization was effected in four hours; while with English coals five or six hours were required. Some of the German gas-works in the North had been using English coal; but they did not find it so satisfactory in cases where they had put in benches of inclineds. The pipes had been stopped very often. Then there was not much necessity for them to make gas of high illuminating power. At a good many of their works, gas of only 14 or 15 candle power was produced. In Hamburg, they made 17-candle gas; but in Scotland he knew that many works produced gas of 20 and 21 candles. They used this quality of gas in Hamburg at the present time, because they had not finished the installation of incandescent burners in the streets; and they had still a good many flat-flames. For these latter they must make gas of 17-candle power. They could not therefore change the quality at present; but as soon as



PLAN.



SIDE ELEVATION.

GENERAL ARRANGEMENT OF HOT-COKE CONVEYOR TERMINUS, AND STORING, SCREENING, AND LOADING APPARATUS.

they had finished the installation of the incandescent burners they would do so. At present, they enriched partly with cannel and partly with benzol; and in winter time partly with carburetted water gas. In some gas-works the cannels were mixed with the ordinary coals; but it had the disadvantage that the coke became very bad. In Hamburg, they used horizontal retorts for the cannel; but he did not see how they were to carbonize it in inclined retorts, without they broke the cannel. When they put a charge of cannel into an inclined retort, the whole charge flew down into the mouthpiece. They had tried it; and it was not possible—it was quite a failure. The cannel could be broken into very small pieces, and mixed with the ordinary coal; but then they did not like it because it made the coke bad.

Mr. A. F. Wilson (Aldershot) said his remarks on the subject would be rather on the financial aspect. He had recently been under the necessity of deciding as to the construction of an additional retort-house of comparatively modest area, but with a productive capacity of something over a million cubic feet per day; and this involved a financial question. He had a predilection for the construction of inclined retorts; but, on the other hand, he felt that it was essential to exercise the greatest caution in spending such a sum of money as was required for the construction of inclined benches. Perhaps if he gave one or two of the reasons that induced him to come to the conclusion at which he arrived, they might be accepted as arguments of the question. He commenced, of course, by obtaining all the information he could with regard to the actual construction and working of the system as it had now taken form. He remembered, of course, the dream he had probably thirty years ago, at which time he went into several matters that were still exercising them. But practically the question resolved itself into a comparison of the relative economy of the working of inclined retorts with the cost involved in the payment of interest for each construction. Upon this point he did not at the time obtain very accurate information; and he came to the broad conclusion that the increased cost involved in interest to a great extent covered the relative economy in the saving of wages. This really cleared away the broad basis of the comparison of the two systems. But it left one or two minor points in abeyance, which most of them could appreciate. He need not go into such matters as the different methods adopted to work the coal hoppers, distributors, and the other mechanical things, but he would deal with the question that exercised his mind something like twenty years ago—that was the angle of repose of the coal upon the retorts. At that time, he thought, as he did now, that the different sizes of coal involved a different angle when spread upon the retort. He knew that the small dross, or the waste species of coal, and the larger kind of coal and cannel would only act upon different angles. He was not going into this matter; because he had no doubt that every one present knew all about it. But, looking at it as a financial man, this was a very important question; and it was the one that decided him in declining at present to erect inclined settings. They must, as engineers, treat the question of coal supply upon its very broadest basis. They could not afford to restrict themselves to the use of this or that particular sort of coal. They must have the power of selecting their coal from anywhere, and obtaining it irrespective of its physical dimensions or its characteristics otherwise. The effect of having to restrict themselves to a coal, would be, as readily recognized, that the coal which was most fitted for these settings, if generally adopted, would in the end be the least advisable from the point of view of price. The very fact that a coal must be suitable for the inclined settings would tend to increase the cost. This would act upon the cost of manufacturing gas; and indirectly this would be a matter of serious importance. When he began to examine into the question, he was told at first that any kind of coal could be adopted; but when he closely inquired into the matter, he found there were only two or three kinds that were suitable. He wanted a broad area of supply; but he was sorry to say, after going carefully into it, with the predilection he had for inclined retorts, he was forced to the conclusion that this restriction of the coal area, and the trouble of determining the kind of coal that could be used, were difficulties in the way of the adoption of inclineds. Coal was really the governing factor of the whole question; and until this factor was settled, he did not see his way to the adoption of the system. He hoped that other men would succeed, so that the basis of the supply of suitable coal would be enlarged.

Mr. F. W. Cross (Lea Bridge) said the author, in referring to the shoe running in and out of the mouthpiece, explained the difficulty of having a fixed angle; and then said that, "in order to overcome it, he had introduced a means of adjusting his angle of the shoe, which will be illustrated and referred to when describing the latest installation at Edinburgh." He (Mr. Cross) had also experienced the difficulty of having a fixed angle to the shoe. He was trying to overcome it, but had not yet succeeded; and therefore he was particularly anxious to hear the information Mr. Herring had to give them. He (Mr. Cross) had a fixed angle to the shoe for each tier of retorts. With the top tier he had no trouble whatever; and the same with the bottom retorts. But with the middle tier, he had. It might arise from many causes. But he did not think it arose from the particular shoe; for all the shoes were of the same angle. There might be a number of causes; he had several in mind.

Mr. Livesey: Do you know the cause Mr. Cross?

Mr. Cross said in the middle tier of retorts, he seemed to have some local heating, and got trouble at the first joint of the retort. That was where the coal seemed to hang up; and occasionally they could not get it down on the stop. It depended on the class of coal—whether small, dusty, or of a larger type. He also noticed that Mr. Herring referred to his hydraulic arrangements for operating the valve at the base of the storage hoppers, and also for pushing the coke out of the retorts. Last year he (Mr. Cross) set up an installation of inclined retorts, and he used hydraulic power for the purpose of elevating the coal. It was not on such a large scale as that described by Mr. Herring. However, having the hydraulic power in use, he thought of employing almost exactly the same arrangement that Mr. Herring had now adopted—of using a small hydraulic piston for actuating the valve on the measuring chamber, and also for actuating the ram. But there was one difficulty in connection with the ram; and so he did not adopt it. Mr. Herring said that the piston working in and out of the retort for pushing out the coke was arranged with an accelerating motion, "so that the piston head would, upon entering the retort, start very slowly and gradually increase in speed, descending from 8 to 10 feet into the retort; thus giving the charge the necessary impulse to traverse down the slope of the retort. When once set in motion, there is not much chance of it again coming to a state of repose." Now, in the discharge of retorts, it was the common experience of everyone that occasionally, when they removed the stopper, half of the coke in the retort, or a portion of it, would at once slide out; and then if the man on the upper floor gave the remaining part a push, the coke would slide down to the bottom of the retort, where it constantly jammed. He should like to know how Mr. Herring would overcome this jamming with his piston, or did he anticipate that the retort would overcome it.

Mr. A. W. Onslow (Woolwich Arsenal), referring to the valves in the shoot inside the measuring hoppers, said he had had to dispense with these valves altogether. They found the thing worked better without the baffles at the bottom of the shoot where the coal entered the retort. There were two or three reasons for this. One of them was that at his works they filled up the storage hopper, which held about 30 hours' supply, in two hours in the morning and one hour in the afternoon (so they had two hoppers filled in the morning with a 30-ton elevator); and towards the afternoon the coal had to a certain extent got to a different texture—finer or coarser as the case might be. The man who did the charging therefore took a small baffle-plate with him, and put it into the mouthpiece; and he could regulate to a nicety exactly what he wanted to do. All he had to do was to use this baffle-plate; and they never had the coal sticking at the top, or any difficulty whatever. The man was able to judge, by the aid of the foreman, exactly where to put this baffle-plate; and they had no trouble whatever now. They had at first; but recently they had taken out the stoppers—a kind of stopper on the shoot to stop the coal and retard its progress—and they were able, by the thin plain sheet plate he had referred to, to get a uniform charge down the retort. Then as to getting the coke out of the retort, as two men could take the coke out of twelve retorts in twelve minutes, he did not think there was much to complain about.

Mr. Herring: It is far better to do 24 if you can.

Mr. Onslow agreed. Then, turning to the question of storage hoppers, he said he thought it was better to have a storage hopper, and a large one, too, so that, in case of

a mishap to the conveyor gearing, they had something to depend upon.

Mr. G. HELPS (Nuneaton), alluding to the fuel results given by the author for the period from Oct. 29 to March 31 last, said the average was 13·35 lbs. per 100 lbs. of coal carbonized. He should like to know whether Mr. Herring had used the same class of coal with ordinary generators. He happened to know of some places where they had simple generators only, and the fuel account was within a fraction as good as it was with this elaborate recuperator that Mr. Herring had shown them.

Mr. S. Y. SHOUBRIDGE (Sydenham) said he was greatly obliged to Mr. Herring for his interesting paper; but he must confess that it would not, in his opinion, advance the use of the inclined retort system. He was sorry to say that, in this latest installation which they admired so much at Edinburgh, Mr. Herring was, in his (Mr. Shoubridge's) judgment, going back on what had been done before in several respects. He was astonished to see that he was making provision for elaborate machinery to get the coke out of the inclined retorts, and that he now said in his paper that the discharging of the coke from the retorts could not claim to be automatic. Well he (the speaker) was afraid Mr. Herring's experience in this respect was not the general one. In his own experience, it was automatic; and he thought the failure in its being automatic in Mr. Herring's case had arisen from the charging appliances he had used. It was unfortunate that nowadays they were going in the direction of adding more machinery to accomplish what had been done in the past without it. He had no doubt at all that it was owing to the flap Mr. Herring had spoken of in connection with the charging arrangements. This, he thought, caused the coal to stick in the retort. He (Mr. Shoubridge) remembered some years ago Mr. Herring showed him his new house of inclined retorts at Huddersfield; and he was then very much astonished to find the men there poking the coke out with long bars to so great an extent as to necessitate travelling shields being put up to protect the men from the heat during the operation. On looking into the retorts, he noticed that the bottom was completely blocked up, owing to the failure of the charging apparatus. This, in his experience, was wholly unnecessary. With proper charging appliances, it was quite possible to ensure the even distribution of coal of all sizes from mouth to mouth—whether it was fine coal or mixed unscreened or coal of larger size, or exclusively cannel coal. There was no difficulty at all in getting an even distribution and an even discharge, no matter what the section of the retort might be; and the retort shown by Mr. Herring, tapering outward, facilitated the discharge of the coke very considerably. Mr. Herring challenged the system of having a few hoppers as compared with the continuous hopper, and said he had always been puzzled to know what train of reasoning brought into existence the central storage hopper as distinct from the continuous hopper system. As regards structural cost, the author said it was no cheaper; but he did not bring forward figures to substantiate that. It was the extreme cost of the continuous hopper system that led him (Mr. Shoubridge) to adopt the other plan. It must be obvious to anybody who looked at the arrangement shown in the diagram, that the continuous hopper and the continuous set of measuring chambers, with their levers, and, as in the present instance, with special hydraulic machinery to open the bottom doors of the chambers, must be immensely more costly than two or three hoppers, or hoppers placed every 50 or 60 feet apart, and without the measuring chambers, and all their accompanying gearing and levers and machinery. The other system answered perfectly well; and it involved no extra cost in labour for distributing the coal from fixed points to the retorts—no more men were employed, and no longer time was occupied. The charging and drawing under the other system was effected in less than a minute per retort; and the whole of the superstructure was much lighter than in the plant shown here. While the girders that supported one or two hoppers must be larger than those shown here, there were only a few of them compared with the large number required with the continuous hopper. Mr. Herring admitted there was no virtue in separate chargers except practical utility. Accumulation of tar and condensable matters was also no doubt due to the imperfect charging arrangements allowing the coal to go down to the bottom of the stop. He noticed in the paper the author said: "The improvements in the construction of coke-conveyors renderi t possible to abandon the stage-floor retort-house altogether, having the producer on the inner side, or preferably self-contained gas producers situated at a convenient point for feeding with coke, and the conducting of the fuel gas to the retort-setting through brick-lined conduits." He should like to ask Mr. Herring why he had not adopted it in his new installation. He quite agreed with him that this was the more economical method—the plan of separate producers which were introduced by Mr. Carpenter at the Old Kent Road works with great success.

Mr. LIVESEY: At Bankside.

Mr. SHOUBRIDGE: And also at the Old Kent Road.

Mr. LIVESEY: But is it the inclined system at the Old Kent Road works?

Mr. SHOUBRIDGE: I do not remember.

Mr. LIVESEY: My brother did it at the Old Kent Road first for ordinary retorts.

Mr. SHOUBRIDGE (proceeding) said that the system of outside producers, such as they saw at Mr. Foulis's works at Dawsholm on the previous Tuesday (*see* p. 620) was no doubt the best way of generating fuel for retort-houses, and it would, in his opinion, before many years were over, supersede the present plan of having a producer for every setting. He should have liked to have heard some remarks from the foreign visitors as to the creeping of coal. So far as his own experience went, he had not found it at all.

Mr. CHARLES HAWKSLEY (London) asked the author to state whether, in the event of a breakdown of this necessarily complicated system of mechanical appliances, he had the means of keeping the gas-making operations going by the employment of hand labour only.

Mr. HERRING, in reply, said he could have wished for a more lengthy discussion; and a more critical one. He purposely laid himself open to criticism in the earlier part of the paper. He wanted two or three important questions discussed—such as the creeping of coal; and it would have been particularly interesting to them if they could have heard from their Continental friends any reason they might have for adhering to the short retorts. In this country, they were believers in the 20-feet length; and inclined retorts had been so long extant with them, that there could not be any question as to whether they would work. The financial results of the different undertakings showed that they worked very successfully. Perhaps some of their Continental friends might address a communication to their Secretary if they could give any information on that point. In reply to Dr. Leybold, as to the use of cannel, they also in Scotland used large percentages of cannel or shale, which was much the same, and they were obliged to make special arrangements in their installation to permit of the charging of certain retorts with common coal or cannel or shale entirely, or with a mixture of common coal and cannel, while others were specially set apart for the carbonization of shale, and the retorts from which the coke was drawn for feeding the producer were arranged to be fed with coking coal only. The residue, after the carbonization of the shale, was refuse, and transported direct to the tip. This separation of the coal in the hoppers was brought about by [pointing to the diagram] inserting partitions transversely across the continuous hopper; and by opening and closing the valves in the bottom of the conveyor trough, the different classes of coal seen to be traversing in the conveyor were allowed to drop into the respective pockets in accordance with their class. In other words, the coking coal could easily be kept distinct to itself; the cannel coal to itself; and the shale likewise. Mr. Wilson had dealt principally with the financial aspect of the question. He might say that this was the sole reason why he gave any attention to inclined retorts, now some ten years ago. Unless they could show some advantage in their annual balance-sheets, he did not think they were justified in bestowing any time upon the consideration of new processes as they came out. He had had experience in the working of inclined retorts now for a considerable number of years in this country. Before he left Huddersfield, nearly five years ago, they had for two winters previous made all their gas in sloping retorts; and he thought Brentford came very soon after them. He had, for the purpose of proving the financial advantages of the system, taken from "Field's Analysis" the carbonizing wages from 1891 to 1900; and he had obtained them from Huddersfield for the same period. He found that at Brentford they had reduced their carbonizing wages, between 1892, when they were 4·6d. per 1000 cubic feet of gas sold, to 2·17d. in 1900. At Huddersfield in 1892 the wages were 4·12d., and in 1900 they were 2·5d. Brentford had 20-feet retorts; Huddersfield

had 15-feet retorts. The figures showed a saving of practically 2s. per ton of coal in one case and 1s. 6d. in the other. Taking the Edinburgh installation, the net cost, including the condensers (which should not be thrown in with the carbonizing plant), elevators, conveyors, and everything else, would not "tot" up to more than £115,000. Supposing he only economized in carbonizing wages to the extent of 1s. per ton of coal, he would get a clear saving on the year's working of £10,000, which would be more than sufficient to pay the interest on the outlay; and he would thus get his carbonizing plant practically free of ordinary capital charges owing to the economy of labour costs. There could be no question, apart from any mere statement of saving, that any engineer who had had experience can back his experience with proof. Wages had not gone down at Brentford. Then what was the reason that their carbonizing wages were now only 2·17d. Mr. Wilson had also spoken about different classes of coal and their troubles in drawing. That was a point he hoped to have had cleared up a little that morning. They knew that in some places where the process had been tried, the coal had been inclined to run down the retorts. Some of them thought that it was the charging arrangements they used which brought that about; and he was inclined to think that that was so. All would agree, however, that if they charged a retort with broken pitch, they would naturally expect it to flow over the stop. If there were any coal that fluxed to that extent, then naturally it would flow. He had purposely obtained the names of some collieries where coal with this tendency was obtained; and he was in hopes of getting some to Edinburgh this year to try in the inclined retorts, in order to get some reliable information on the point. He had not been able to do so, owing to many other calls upon his time. He wrote to one of the collieries, who asked whether he would receive a cargo by water, as they raised coal from seven different pits. There was no harm in mentioning the name. It was the Pelaw Main Collieries. They informed him that if they sent it by rail, it would be unsatisfactory, as only one kind would be sent in each truck; whereas in shipment they made a point of getting a thorough mixture of all the different classes. Therefore, they added, if he (Mr. Herring) could see his way to take a small cargo, he would be quite sure of a thorough mixture, the same as they sent to all their other customers. He had seen this self same coal worked in inclined retorts; and there had been no trouble. He had also got the names of some of the very worst coal—Mr. Carpenter had given him some, and Mr. Gibb, of Newcastle. He would be able to try them under the conditions he had been working under; and probably on a future occasion he might be able to give them some information on the subject. He was sorry to say, in reply to Mr. Cross, that the diagram of the shoot was not finished in time for the meeting; but he would arrange, if it was finished in time, to reproduce it with the other diagrams, and he thought it would be found to be self-explanatory. Mr. Onslow spoke of the working of the valves to the measuring chamber. He was not sure whether he referred to the one regulating the discharge or the other. However, he did not think it was important. He seemed to agree entirely with the principle he (Mr. Herring) laid down in the paper; and he accomplished the same thing by temporary means, instead of permanently. Mr. George Helps inquired about the fuel account. That, he might say, was ascertained by knowing the exact weight of coal used in the retorts, and the exact weight of coke taken from the retorts; the difference being used as fuel. They knew, from long experience and by their tests, how much coke was yielded per ton of different coal.

Mr. Foulis: Can you not give it for a number of retorts?

Mr. Herring: I have not got the figures at hand just now. I have it in pounds.

Mr. Foulis: Suppose you charged nine retorts?

Mr. Herring said he could not give Mr. Foulis the figure then; and he could not answer Mr. Helps' question in regard to working the same fuel in simple generators. In his works, he used the Siemens regenerators almost entirely. He had about 27 different sorts of Scotch coal.

Mr. Helps: You would not be using any shale or material of that sort?

Mr. Herring said he used more or less a caking coal—a fairly good coal, but not so good as the English coal. Mr. Shoubridge, he thought, dealt first with the introduction of mechanical discharging appliances. He thought his paper merely suggested that such a thing could be introduced, and that he (Mr. Herring) was making provision for it. He did not exactly say he was going to put it in; but the principle of the process was this: They wanted to reduce their wages to the lowest possible limit. If they could do this by employing mechanical means upon which they could depend, they must do it, or else they would be failing to do their duty to those who employed them. Of course, the principle was to be applied on the understanding that the mechanical appliances were reliable. But he thought this apparatus was going to be a very good thing. At any rate, it would not cost very much, and they could try it. Mr. Shoubridge seemed to suggest that the discharge of the inclined retorts was automatic. Now, he thought there were many there who knew that they were not. If they got 50 per cent. of their retorts discharged automatically in twelve months, they would be doing very well. Mr. Shoubridge spoke about what he saw when he visited the Huddersfield installation. He would return the compliment by saying that, when he visited Mr. Shoubridge's works at Salford, he saw two men on the charging floor pushing the coke down the retorts with rakes. But there was not much profit in arguing such points; the shield which Mr. Shoubridge referred to was employed to direct the coke to the waggons on the coke floor below. With regard to the hydraulic cylinders, it was of course a matter quite open to discussion whether these were or were not an advantage. He (Mr. Herring) said that it was because he was going to get more work out of his men by its use. He would get more work out of his men by their simply having to turn a handle, instead of their having to open a valve by force with compound levers. As he had had them working now for five or six months, perhaps he might presume to know it was going to be all right. He should not put them in at Granton if he were not satisfied. Then Mr. Shoubridge asked him why if he suggested that the improvement in the construction of hot-coke conveyors made it possible to abandon the stage-floor and return to the ground-floor retort-house, he had not adopted it at Granton. It was simply a question of evolution and development. The idea occurred to him after he had started at Granton; but if it had occurred to him before, he did not think he should have ventured the new idea on such a huge installation. He thought that somebody who was putting up a small installation might reasonably try it, as so much money would not be risked as they would have had to risk at Granton, on the possibility of its being a success. Mr. Livesey informed him that the heating by means of external producers was done at Bankside. Mr. Hawksley raised a very important question as to the means, or the provision, made for continuing operations in the event of any breakdown in the machinery and appliances. Their experience with coal-breakers, elevators, and conveyors was such as to give them every confidence in anticipating very regular work from them. Elevators and conveyors had now been used in many gas-works; and they found not only that they were reliable, but, as Mr. Chester had shown them that day, the costs for renewals and maintenance were very small—showing that the wear and tear was very little. As a matter of fact, that part of the machinery of a retort-house only worked on an ordinary day for eight or ten hours; and there was thus plenty of time, during the night, to carry out renewals or repair any links or chains which might have manifested any weakness during the day. With regard to the introduction of hydraulic cylinders for working the rams, it was intended to have a few of the cylinders at hand; and as they would be interchangeable, one could be put in in a few minutes, in the event of a complete breakdown. In addition, a lever could be portably attached to the chamber levers and worked by hand from the stage floor.

Dr. Leybold asked to be allowed to say that the reasons why they did not use 20-feet retorts in Germany were: First, that it was hard to repair the retorts; and they would have to use sticks of more than 10 feet long from either end for the purpose. Then, again, in Germany they had very bad ground; and they feared such long retorts would likely sink. In some works, the ordinary length of inclined retorts was not always of the same equal temperature at both ends; and they feared they would find this to a greater extent with the longer retort. More recent experience had shown that the heating was better now.

The coal measures were struck on Saturday at the Kent Colliery Works, at Dover; and the keenest interest is being felt in the results of the operations.

AUTOMATIC LIGHTING AND EXTINGUISHING OF STREET LANTERNS.

By A. Rothenbach, jun., of Berne, Switzerland.

[A Paper prepared for the Gas Section of the Engineering Congress.]

For many years past, attempts have been made in the direction of lighting and extinguishing street-lamps by some automatic or mechanical means, which would be more reliable and less expensive than the present system.

With the introduction of Welsbach gas-burners for the public lamps, arose the desire to light them in a way similar to that usual with electric incandescent and arc lights; and from this time date most of the trials made in this direction, especially those with the aid of electricity.

For this purpose, separate wires were drawn between the lamps, and small devices fixed, by means of which the valves could be opened and closed by the electric current, and at the same time the gas ignited, either by electric sparks, platinum black, or through a wire brought to red heat.

In course of time, however, many disadvantages showed themselves, such as: (1) The breaking of the wires by the weight of snow or some other cause; (2) their entangling with other wires, especially those of trolley lines; and (3) changes of temperature causing the oxidation of the contact-buttons, and otherwise influencing the small electric devices. In most of these instances, it is difficult to locate the defect which causes the interruption of the current. Putting the wires underground only increased the cost of installation, without improving the situation.

A second method was to light and extinguish by means of compressed air. This system has the disadvantage that leaks or obstructions in the small pipes to be used, and which have to be laid underground, would, until found, cause a great expense, and until repaired, would put quite a number of lamps out of use.

A third way to accomplish the desired end was tried with an apparatus influenced by the difference in the pressure of the gas. But it was found difficult to procure the required difference in a distance of many miles, especially where the pipes leading into the houses are connected with the same main, and in towns where the streets are hilly. This system has failed altogether, as is proved by an attempt made in Brussels to measure the gas consumed during the hours of day and night with one and the same meter.

A fourth method is that of a hydraulic apparatus based upon the difference in the gas pressure or compressed air, which proved a failure also on account of the evaporation of the fluid and the influence of cold.

Attempts have been made in other directions unknown to the author; but they have without doubt fared no better than those mentioned. There is, in the author's opinion, but one way to solve this problem, and that is by the use of some device whereby each lamp can be lighted and extinguished independently of the others, so that, in the event of a failure through any cause, one lamp only, and not a whole section, will be affected.

The Gas Engineers' Association of Switzerland have requested me to show and explain to you such an apparatus made by the Actien-Gesellschaft für autom. Zünd-und Löschapparate in Zürich, which Company have now, after experimenting for three years, brought it to such a perfection that it seems to answer all demands. The apparatus consists of clockwork of the very best quality, and which cannot be influenced by changes of temperature. It is hermetically enclosed in a brass box, containing the valves (separated airtight from the movement to prevent gas escape and explosion), which are set in motion by the spring of the clock. The apparatus is placed in the centre of a wrought-iron support specially constructed, which can be fitted to every description of lantern. The whole has a neat appearance, and throws no shadow. The movement itself runs twenty days, but should be wound up every fortnight. Once within that time, at least, the lamps have to be cleaned, and the lighting-hours changed; so, without extra expense, the winding and time-changing can be attended to by the lamp-cleaner.

The advantages of this system are the following:—

(1) Each lamp can be lighted and extinguished at any designated time, without regard to others. Thus narrow streets, courtyards, parks or public squares, railroad stations, &c., can be lighted or extinguished earlier or later than others as occasion requires.

(2) Any number of them can be lighted and extinguished together within a few minutes' time; while it requires now from half-an-hour to an hour to do this.

(3) The mantles of the Welsbach lights are better preserved, because the apparatus only opens the valve gradually to let the air escape (thus preventing an explosion), and because the jar caused by the knocking of torches against the lamps is done away with.

(4) A great many lights can be extinguished about midnight. Some cities allow these to burn all night, because a third round on the part of the men would add more to their wages than the amount saved in the gas consumed.

All the conveniences mentioned, together with the saving of gas and in the wages of the lamplighters, should induce many managers of gas-works to interest themselves in this new invention.

I will not omit to mention that the apparatus can be furnished in five different constructions—

(1) One with a simple stopcock.

(2) One fitted with a regulating-cock, through which the lantern can also be lighted and extinguished at any time by turning the lever. This has also an arrangement with which the action of the movement can be detached, and is suitable for such towns as during moonlight or summer months suspend lighting altogether.

(3) One for lighting and extinguishing two to three flames together.

(4) One which will light two flames, and extinguish them singly, at different times.

(5) One that can light and extinguish twice within twenty-four hours.

By means of these different arrangements, it is not necessary to do away with any lanterns now in use, or employ help for such special lamps.

Prominent cities like Zurich, Geneva, Lucerne, and Winterthur have now over a thousand of these appliances partly in use or in course of putting up; and they will readily give you a report of their experience with them.

The above paper was read at the close of the sitting on the first day of the Congress; and before the proceedings commenced next morning, Mr. Alfred Kitchmann gave a demonstration of the arrangement. This explained the working of the apparatus, which certainly was not made clear by an inspection of the drawings exhibited at the meeting. Mr. Kitchmann has since sent some illustrations and further particulars of the plant.

Fig. 1 (p. 778) shows the arrangement on a street-lamp; and fig. 2 the outside dial, by moving the hands of which the time of lighting and extinguishing the lights may be varied. The hands M and S are ordinary clock hands; the smaller ones *e e* are those to be placed upon the figures of the inside dial at the time when it is desired that the apparatus shall light and extinguish the gas. In the example shown, the time of day indicated is 3.35 p.m., the time to light 6.15 p.m., and the time to extinguish 7.30 a.m. the following morning. By pressing the lever *i* to the left, the apparatus is set in motion at any time.

Fig. 3 shows the arrangement of levers attached to the appliance, by means of which the gas can be turned on or off by hand in the usual way. The lever has merely to be moved to the position I. to allow the gas to pass direct to the burner, and to the position II. to stop same. The small cock B is for the flash-light, and is actuated by means of an ordinary box-key.

Discussion.

Mr. J. L. Chapman (Harrow) said the members were very much interested in this beautiful arrangement for the manipulation of the lighting of public lamps. He thought the lamplighter was the most difficult man they had to deal with in gas companies; and anything which would tend to do away with him, and bring in an automatic arrangement for the lighting of public lamps, would be a great blessing. He (Mr. Chapman) had fourteen different local authorities to deal with; and he really thought he had more trouble with the public lighting than with the private consumers. Those present, he was sure, felt very much obliged to M. Rothenbach for bringing before them this beautiful device. Of course, the question of cost must come into consideration, and also that of the climate of our peculiar country, more especially Scotland, where they were

FIG. 1.

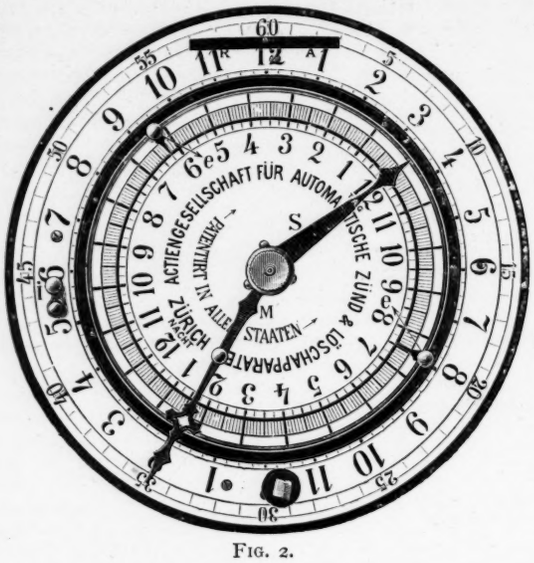


FIG. 2.

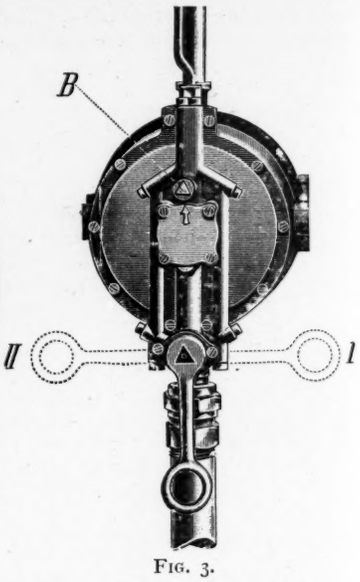


FIG. 3.

troubled with so much rain and mist. Some of them who travelled on the Continent felt a great benefit from going there, because the sky was bluer and the amount of fog was also much less. They were obliged to the author for preparing this paper. He (Mr. Chapman) would like to test the apparatus himself on a lamp, to see its effect. The great question with the English people would be that of expense. Some of them would like to know what it would cost to fit up a single lamp for ordinary lighting purposes.

Mr. C. C. CARPENTER (London) said he had nothing to add to the information already given. But he understood the principle of the arrangement; and he was convinced that the only successful solution of the automatic lighting and extinguishing of public lamps was a method such as this, which involved the use of a valve regulated by clockwork mechanism in the lamp. He was in accord with the author that this was the only possible solution of the difficulty which had been more or less present in the minds of all of them. It seemed unsatisfactory to have a staff of men over the whole area of the city for the purpose of lighting and extinguishing the lamps. Take, for instance, the South of London. They had an area of 50 or 60 square miles; and it seemed unsatisfactory to have to start men off every night to light up the lamps, and then again in the early hours of the morning to extinguish them. He looked forward to something identical with what the author had described being brought forward to do away with this anomalous condition of things.

Mr. T. HOLGATE (Halifax) remarked that he had had some little experience of the lighting and extinguishing of lamps by means of apparatus somewhat similar to that brought before the meeting. He was not aware whether it was generally known that Mr. G. Gunning, of Bournemouth, had been working on these lines for some time past; and he had sent out a few samples of his appliances. They had been very well satisfied with the machines that he had furnished; the only drawback being that in some cases the clockwork had not been so good as it ought to have been. But otherwise their experience had proved to them that the principle was a sound one; and, if the mechanism could be made durable, then success ought to attend this system. He should be very pleased indeed to try one of the author's appliances, to see what the result was in actual working. He should like to ask what length of time they had been in use; and what had been the general experience as to reliability and wear and tear.

Mr. G. R. LOVE (Guildford) asked, supposing the clockwork failed, by what method the lamp would be lighted.

Mr. W. FOULIS (Glasgow) said the members must all feel that, whatever the practical result might be, they were much indebted to the author of the paper for bringing this interesting invention before them. The only remark he could make with reference to it was that everything depended upon the durability of the clockwork arrangement. It was a rather formidable proceeding to put clockwork of this kind in every lamp-post; and therefore the mechanism would have to be exceedingly durable and perfectly reliable. Of course, the consideration of cost was one of very great importance, as was also the question as to the extent to which the apparatus would save the employment of lamplighters, because it would always be necessary to have men to attend to the cleaning of the lamps; and therefore the whole expense would not be saved. On this point, perhaps the author would be able to give them some further information.

Mr. A. KITCHMANN (London), replying on behalf of Mr. Rothenbach, said they had had experience of these lamps for over three years, and had had them at work in the greatest cities on the Continent—Berlin, for example. Of course, they had had many failures; but now they were sure they had reached perfection. So far as the clockwork was concerned, it was made in Switzerland, which guaranteed it to be splendid mechanism. It was made out of the best materials, and fitted with the best sort of rubies. All the movements ran on rubies; and if there was a stoppage, it could be rectified by very easy means—by having a sort of pendulum they could start it again. They had to make a splendid clockwork somehow; and it was rather expensive. The samples cost 67 frs., free London. Of course, if two or three burners were required, there would be some additional cost, 2·50 frs. up to 5 frs.—say, from 2s. to 4s. They guaranteed the perfect working of the apparatus for five years; but he could assert that it would last ninety years. They had reckoned out the cost; and they found it would only take three or four years to pay for the adoption of the apparatus over a whole lighting system—thus anybody who put up a system of 1000 lamps would, through the saving in wages, mantles, and gas, fully pay for it in three or four years. He wanted to point out once more that the apparatus would last from sixty to ninety years; there was absolutely nothing destructible about it. The pipes in the clocks were air-tight, and no gas could escape from them to affect the clockwork. This was one of the most important points. Neither would the clockwork be affected by differences in climate. They had tested this all over the Continent, and did not find a difference anywhere; and he did not think even the climate of Scotland would affect the apparatus. If those gentlemen who would like to give the system a trial would send their names, they could have a lamp on approval for a certain time.

GOBBE'S "QUENCHING" PRODUCER.

A Supplement to the Manufacture of Carburetted or Uncarburetted Water Gas in Gas-Works.

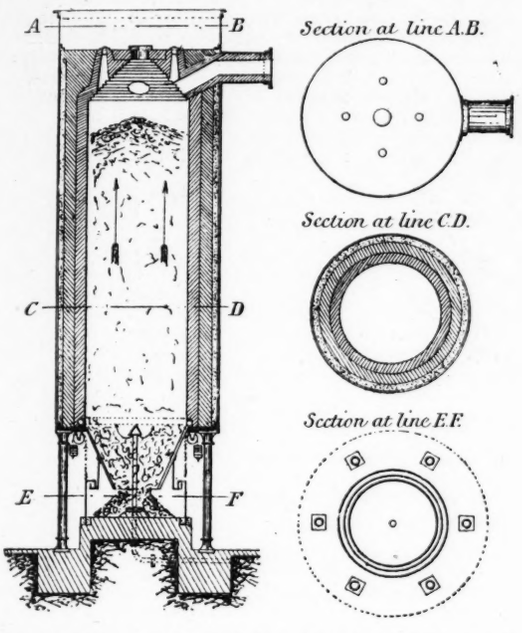
By FERNAND BRUYERE.*

[A Paper presented to the Gas Section of the Engineering Congress.]

A great saving can be effected in the manufacture of water gas, either carburetted or not, by modifying the usual method of quenching coke in the open air, and by adopting steam, while the coke is at a red-white temperature, such

* The author did not exhibit any drawing of this patent arrangement; so we reproduce the illustration of Gobbe's "Quenching" Producer from the paper on the subject presented to the recent meeting of the Société Technique de l'Industrie du Gaz en France. See "JOURNAL" for July 23, p. 208.

as it is when drawn from the retorts or coke-ovens. The commercial attainment of the well-known reaction, $H_2O + C = H_2 + CO$, which invariably occurs whenever coke and water are brought into contact at a temperature of 600° C. (1112° Fahr.) or more, is arrived at in practice by the quenching-producer designed by M. Emile Gobbe.



The quenching-producer, briefly described, is in the form of a vertical chamber of a certain height, constructed so as to reduce to a minimum the loss of heat by radiation. The different openings required for working the apparatus are so arranged as to prevent any air getting in. The method of working is as follows: The coke, on being taken from the retorts or coke-ovens, is received into tip-waggons, which are then emptied into the apparatus through the door provided in its upper part. A supply of water, in the form of steam or fine spray, is led into the bottom of the vessel. The size of the quenching-producer is calculated from the amount of coke to be extinguished and the time allowed, according to the exigencies of the make, so that the coke may reach the bottom of the producer quenched as desired.

It is in the upper part of the apparatus, where the temperature is sufficiently high, that the reaction takes place—that is to say, in half of the height of the producer. In the lower part of the vessel, the coke is at an insufficient temperature to cause the decomposition of the water; but by its contact with the rising flow of steam, the coke becomes extinguished in proportion to its fall, by imparting the temperature it still has to the steam. The water is, therefore, gradually heated to the required temperature to enter into the reaction, while also effecting the quenching of the coke, which reaches the lower part of the apparatus extinguished, where it is picked, sorted, and afterwards lifted, either by forks or by mechanical elevators.

Owing to the small consumption of coke, the steam is decomposed into $H_2 + CO$, with only traces of nitrogen and carbonic acid. The gas formed differs considerably from water gas made by other processes. The gases obtained are particularly suitable for use for motive power, for lighting (either directly or after carburetting), or, better still, for heating the retorts in gas-works.

The amount of calories produced by the apparatus per 70 kilos. (for example) of coke—the residual of carbonizing 100 kilos. of coal—should be able: First, to decompose a certain number of (x) kilos. of steam; and, secondly, to give to the hydrogen and carbonic oxide formed the calories which these gases will carry in a marked degree by leaving the apparatus at the temperature of 600° C (1112° Fahr.). This thermo-chemical quotation will give us the yield.

The 70 kilos. of red-hot coke will bring in 70×350 calories = 24,500 calories. The decomposition of x kilos. of steam will require $x \times \frac{1}{9} \times 29{,}000 = x \times 3222$ calories for the formation of hydrogen; and the carbonic oxide, which will be produced at the same time, will release $x \times \frac{8}{9} \times 2473 = x \times 1648$ calories. The decomposition of x kilos. of steam will require $x\ (3222 - 1648)$ calories.

The calories carried by the hydrogen and carbonic oxide produced will be given by the product of their weight and the specific heat of these gases at 600° C.

The number of calories introduced by the gases arising from the decomposition of x kilos. of steam will be—

$$x\left(\frac{3409}{9} + \frac{14}{9} \times 0{\cdot}245\right) 600$$

Therefore, the equation will be—

$$70 \times 350 = x\,(3222 - 1648) + x\left(\frac{1}{9} \times 3409 + \frac{14}{9} \times 0{\cdot}245\right) 600$$

This equation gives $x = 12{\cdot}06$ kilos. of steam. These 12 kilos. of steam, in becoming decomposed, will require six-ninths of their weight of coke—that is, 8·04 kilos. The density of the gases produced will be 0·67 kilo. per cubic metre. Thus there will be $\frac{12{\cdot}06 \text{ k.} + 8{\cdot}04 \text{ k.}}{0{\cdot}67 \text{ k.}} = 30$ cubic metres. In order to make 30 cubic metres of hydrogen and carbonic oxide gas, 8·04 kilos. of coke will be used; and, therefore, there will be made $\frac{30 \text{ c.m.}}{8{\cdot}04 \text{ kilos.}} = 3{\cdot}730$ cubic metres per kilo. of coke.

In conclusion, it may be claimed that the gases made by the quenching-producer are purer than those obtained in the manufacture of water gas. They have also a higher calorific power, and are therefore more suitable for various uses. The combustion of the 30 cubic metres of gas made by the coke (70 kilos.) left from the carbonization of 100 kilos. of coal, is capable of giving a larger number of calories than that developed from coke used in the Siemens producer. The distillation of the fresh charge of coal to be carbonized can be effected by the gas made from the residual in the quenching-producer. In the Siemens producers, the coke used is 14·80 kilos. per 100 kilos. of coal carbonized. In the quenching-producer it will be 8·04 kilos., which is an economy of $\frac{14{\cdot}8 - 8{\cdot}04}{14{\cdot}8}$, or more than 45½ per cent. The gas made by the quenching-producer will not cost half the price of water gas. The make of serviceable gas per kilogramme of coke is double, which is obvious, seeing that there is no coke consumed in order to feed the incandescent mass as in the ordinary way of manufacturing water gas. The quenching-producer will do away with the troublesome fumes arising from extinction in the open air, and will prevent the loss of carbon caused by ordinary extinguishing. The apparatus costs little to erect. It is simple to manage, and does not need any reversing of sensitive and dangerous currents. In short, the adoption of this invention in gas-works will, in the author's opinion, be most advantageous, because water gas made in the most economical way possible has the further merit of being purer and richer in calorific power.

A Physiological Photometer.—In photometric measurements, a given source of light is compared with another taken as a standard. The existing standards generally have flames that require a perfectly calm atmosphere; and this is rarely found. It is therefore proposed by M. Stanoievetch to dispense with standards in photometric measurements, which can be done by employing the "physiological photometer," a description of which appeared in a recent number of the "Comptes Rendus." It resembles in shape a small telescope 8 or 10 inches in length, and 1·5 to 2 inches wide. A ground glass receives the rays of which the power is to be ascertained. At a distance of 1·5 to 2 inches, there is an iris diaphragm, the opening of which can be varied on the outside as required; the drum of the diaphragm is divided into millimetres. The opening of the diaphragm illuminated by the ground glass is placed in the focus of a convex lens, so that the issuing rays are propagated in a parallel direction. Some of the rays illuminate a small round orifice, 0·15 to 0·2 inch in diameter, made in a metal plate a few inches farther along. This opening is observed from the other end of the apparatus by aid of a magnifying glass. The instrument is employed as follows: The diaphragm is almost entirely shut, so that nothing can be seen through the magnifying glass. As soon as the eye has grown accustomed to the darkness, the diaphragm is gradually opened, until the orifice can be clearly distinguished, and the division of the drum is then noted. For use in the street, the instrument must be previously graduated. A standard light—for example, the decimal candle—is placed at a distance of 16 feet. The division on the drum is noted when the round surface is distinctly visible. Another light of which the power is known is then placed in the same spot, and the division of the drum again noted. By repeating this operation with other known standards, a curve can be made representing the degree of visibility of the impression produced on the retina by the different sources of light—taking the divisions of the drum as abscissæ, and the corresponding intensities as ordinates.

ESSAYS AND REVIEWS.

THE STRIKES AND LOCK-OUTS OF 1900—THE TAFF-VALE CASE.

How hardly hit the professors of Trade Union management have been by the judgment of the House of Lords in the Taff Vale Railway case, may be understood from the amount of the outcry that has arisen from them on all sides. We have recorded the effect of this shock upon the Trade Union Congress, recognizing the prudent reserve with which the matter was treated, on the whole, by the more practical-minded of the delegates. In the so-called Trade Union movement, there are, however, certain undercurrents which, although not strong enough to determine the course of the movement as a whole, are yet sufficiently conspicuous to attract notice on their own account. When people talk of Trade Unionism and Labour politics, they usually think chiefly, if not wholly, of such matters as rates of wages and hours of labour, assuming implicitly that these are the main preoccupations of the Unions. This is the correct view of the majority of Trade Unions and their active administrators. The same opinion is borne out by the report of the Chief Labour Correspondent of the Labour Department of the Board of Trade (issued last week) on the Strikes and Lock-Outs of 1900. Most of these outbreaks related to disputes about wages and nothing else. This pecuniary business being the main thing studied by the great majority of Trade Union executives, it is easy to understand why they were not agitated overmuch by a legal decision that did no more than put their operations upon a legal footing.

Besides, after all, as the small Blue Book containing the report already mentioned conclusively shows, strikes and lock-outs do not bulk largely in the everyday working of Trade Unions. This official statement covers such much-advertised disputes as the strikes of the Thames lightermen, the Taff Vale Railway employees, the Penrhyn quarrymen, and the Staffordshire pottery workers. Yet all these strikes and lock-outs only involved about 2·2 per cent. of the industrial population of the country, and caused an average loss per head of less than half-a-day's work in the year. In other words, one football match represents the total cost to the national industry of all those terrible conflicts between the lion of capital and the lamb of labour, which platform orators dilate upon with so much unction at mass meetings. Thus the entire bottom falls out of the case that is occasionally heard of, under similar conditions, for the extension to the United Kingdom of the New Zealand system of legislation for the prevention of strikes. As if to further drive home this lesson of their statistics, the Labour Department of the Board of Trade go on to state that "the great majority of disputes were arranged directly between the parties or their representatives; the number settled by arbitration, conciliation, or mediation being only 32, compared with 38 in the previous year." And a good many trumpery affairs not otherwise worth a moment's consideration, together with some very faint cases, were counted in to make up this tally.

These truths will, or should, have all the force of a special revelation for those good citizens who take their only knowledge of labour questions from the newspapers, and should be borne in mind by the ingenious gentlemen who write upon these topics. For what do the facts indicate? They show, first, that the greatly-talked of trouble of strikes, "sapping the vitals of the national industry" and so forth, is largely imaginary. Strikes and lock-outs there are, of course, and they are very troublesome. But they are usually local, and do not seriously affect the industrial situation as a whole. Secondly, it is quite possible to do without them. Most of this kind of trouble in the past has been aggravated, if not wholly brought about, by certain vain and arrogant individuals, either feather-headed or moved by considerations of self-interest and glorification. It is this class of Trade Union officials who are raising most hubbub over the Taff Vale Railway decision. They are usually something else besides labour representatives. Generally they are Social Democrats, when they are not Independent Labour personages. Those of the former persuasion held a meeting in London last week to discuss the House of Lords decisions, which was addressed by Messrs. Steadman, Thorne, and others. It was unanimously resolved that the only course to take was to send 100 labour members to Parliament at the next general election. Inasmuch as the last general election was most disastrous for candidates of this brand, it is difficult to see the hopefulness of this suggestion. The passing of such resolutions, drafted with all the pompous verbosity of German Socialistic dogmatism, proves how completely the teeth and claws of the mere strike organizer have been extracted. It was admitted by several speakers who have been engaged in these little affairs in the past, that the House of Lords judgments had fixed upon the Trade Unions legal responsibilities which would make it practically impossible for them to promote strikes. Hence the bitter cry for more labour members of Parliament, in order to obtain the control of political power "as a means to the complete ownership and control of the instruments for the protection and emancipation of the working classes from the domination of the capitalists." Of course, this ownership is to be exempt from all the ordinary liabilities of property holding; and a pretty state of things would follow then!

Returning to the report on strikes and lock-outs, it deepens the impression which we have mentioned on previous occasions, that it is high time the Government reconsidered the policy of maintaining the hot-bed of Trade Union agitators who were passed into the service, without the usual examination, by the mistaken kindness of the late Mr. Mundella, and constituted the Labour Department of the Board of Trade. It is difficult to see how they can earn their several salaries. Here again we have the Chief Labour Correspondent reporting to the Comptroller General, and every miserable workshop squabble enumerated, classified, dissected, and necessarily, but regrettably, magnified into an event. There is too much glorification of statistics, which are out of all proportion to the intrinsic value of the matter. In the great majority of instances enumerated, it must cost the nation far more to ascertain the facts and post them up than it does to settle the whole business. This is truly to exhibit statistics run mad.

Nor are these statistics to be implicitly relied upon; they are often from a tainted source. Knowing who collects and edits the figures, what faith can be reposed in the deduction that there was "a striking increase in the number of workpeople who came out rather than work with non-Union men"? The whole force of this observation might be taken away by merely counting in the number of workpeople who are never asked a question on the point. It is admitted that a very considerable proportion of the cases enumerated were supplied by the miners, who have largely adopted the method of pressing into their Unions those men who would not volunteer. All these instances of tyranny are entered in the tables as disputes terminated "in favour of workpeople," and set off against those catalogued as ending in favour of the employers! It has to be admitted that in many of these disputes the employers took no part whatever. Still, they are officially catalogued as conquered by the forces of Trade Unionism.

The bias of Trade Union sympathies is evident throughout this report. Especially is this to be seen in the curt account of the Bethesda dispute, which is stated to have originated in "a strong feeling existing among the workmen employed in Lord Penrhyn's quarries at Bethesda against the contract system of giving out work." On this account, "one of the contractors was driven out of the quarries by the men; the partner of this contractor and his sons being similarly expelled a few days later." In other words, the men assumed possession of the property of their employer, which they wanted to deal with according to their own wishes; but, of course, this is not the official version. As to the Thames lightermen's dispute, which was aggravated by the action of some of the men in stopping work after arbitration on the questions at issue had been agreed to in principle on both sides, it is stated that the dispute terminated with the acceptance by the men of the employers' views of the questions. The official scribe had some difficulty in describing the Taff Railway dispute with sufficient impartiality to pass muster. He admits that the Company throughout declined to deal with the Amalgamated Society of Railway Servants, but cannot resist the temptation to mention the circumstance that the President of the Board of Trade wrote directly to the Secretary of the Amalgamated Society of Railway Servants. So somebody of importance, at any rate, was polite to the Trade Union that caused the trouble!

As is customary, the report makes the most of the work of the various agencies existing for the conciliation and arbitration of cases of dispute, small as their share of the confidence of the industrial community really is. It is pointed out that the main work of such agencies for conciliation and arbitration is the settlement, not of strikes or lock-outs, but of questions which might otherwise lead to strikes and lock-outs. On the same basis, many impending troubles have been averted by means which never received the credit due to them on this score. More than one revolution has been prevented by a shower of rain. On the other hand, what is a Conciliation Board to do if there is nobody to conciliate? Will there not be the temptation to exaggerate quarrels in order to have the fun of composing them? In Old France, it was not found that creating the office of Lord High Wolf Killer served to materially diminish the number of wolves.

On the whole, notwithstanding the elements of value that undoubtedly exist in these returns, we are of opinion that the job is greatly overdone. If it is desirable to collect and record the particulars of every so-called industrial dispute—even to when half-a-dozen labourers strike because the employers refuse to continue the ancient custom of "subbing" before pay-day—the work could be performed by a few lower-division clerks at a considerable saving upon the cost of the existing staff. These old stagers dropped in for a "soft thing" under Mr. Mundella; and nobody wishes to deprive them of the sweets of office. But they are elderly men, and need not be replaced. Some working Member of Parliament ought to make a point of seeing to this. Lastly, the most careless scanning of the information so carefully collected and tabulated reveals the general truth that, Union or no Union, rough justice is usually done in the premises, according to the eternal rule that things generally pass for their money's worth in this work-a-day world. The consideration of whether men who want more money for their labour belong to a Trade Union or not, does not appear to affect the issue at all. London dock labourers get more money in January for the asking; but when in June they prefer various other demands, the curt record is that work was "resumed on employers' terms." Where was the Union in each case? The report is well worth procuring by all employers of labour, as it contains much useful information.

ENTHUSIASM: A LESSON OF THE GLASGOW ENGINEERING CONGRESS.

"The prosperity of the Congress, taken as a whole or sectionally, was due to the enthusiasm of all who were concerned in it."—*Vide* "JOURNAL," Sept. 10 (p. 614).

IN all the walks and callings of life, nothing of note is done, has been done, or will be done without enthusiasm. Limiting this generalization, for present purposes, to the gas industry, and taking stock of events within memory and all pre-existent records, nothing great can be discovered that has not been performed by the enthusiast. Murdoch was an enthusiast, so was Clegg, and so were the line of gas engineers who followed, and who gave us the fundamentals of our gas practice. Then coming to modern times, we have Welsbach with his incandescent gas mantle, Coze with his inclined retorts, and Lowe and others with their water gas—all of whom were moved by enthusiasm in the respective paths in which they have earned renown and an imperishable memorial. Then the men who are at the top of the ladder of the gas profession to-day have all, in one or more ways, shown enthusiasm in their work; and those who are nearing the top to succeed them are likewise found to be endowed with more than ordinary ardour, and are not content to shuffle along the already well-beaten track.

Of course, all gas men cannot be at the top of the ladder; the uppermost rung is not of sufficient breadth to contain them. But it is within the power of every gas engineer and manager to struggle for ascension, and to get as high up the ladder as possible. The honours of the gas profession are perhaps numbered; but those who have the dealing out of these honours are not, as a rule, in their own interest, slow to recognize to whom the honours are due. They do not confer them upon those who stand inertly at the foot of the ladder. It is the men of innate ideas and action, and who give evidence of enthusiasm in their professional work, who attract attention to themselves, and who ascend. It is not bombastry or boastful pretension that impresses—it is solid work, and then the public proof of its solidity and value, that bring the intellectual competence of the worker into notice, and mark him for higher things. The man who labours to attain a more prominent place in his profession is an enthusiast.

Now for a moment let those who have not ascended high in the professional scale blow out their own candles, so as the clearer to view the lights of those who have attained to such eminence as the gas profession affords? What will they see? From the present point back to the beginning of those careers, they will see work saturated by enthusiasm; and the results of that work have not been hidden under a bushel. We come to our point. In this age as in all preceding ages, in the gas profession as in all other professions or callings, the man who is enthusiastic, and who lets his light shine before his fellows, is the man who secures the best of the rewards which are to be offered. That is the way by which men have ascended, and the way by which they will continue to ascend. Those who have risen to an honourable position in the profession have not done so by a hidden enthusiasm; they have given to their colleagues the results of their thought and work. One of the platforms they have chosen for doing this has been the meetings of our technical organizations. If the rank-and-file of the official section of the industry had only recognized this—that elevation in professional status and higher rewards depended to a large extent on their work, the enthusiasm they put into it, and the publication of the results—many of the professional meetings would not have been so poverty-stricken in respect of technical matter as they have been during the past year or two.

This is one of the lessons we have drawn from the Glasgow Engineering Congress. The man who conceived it was an enthusiast; enthusiasm impregnated the idea; and it fructified to an abundant fruitfulness—in the attendance numbers and in the variety and quality of the papers. Looking at the Gas Section alone, we find in the authors—the English and most of the foreign—confirmation of what we have already written. Most, if not all of them, have attained to places of supremacy in the gas industry. Enthusiasm has marked their past work, and to their own honour and benefit, and the advantage of the gas industry, they have not hesitated to give freely of the best fruits of their labours. They have reaped as they have sown; and the lesson should not be lost. Empty vapourings have not raised them to their present positions. What they have presented to view have been edifices erected on a concrete substratum of fact educed from careful, searching work. If, then, greater enthusiasm animates the individuals of the profession, the technical organizations and the gas industry will assuredly benefit; the individuals themselves cannot fail to benefit intellectually; and they will stand the better chance of that advancement which has as its accompaniments honour and personal gain.

The development of illumination, or rather the evolution of artificial illumination, is the subject of a short paper by Mr. Walter Hough in Vol. III., of the "American Anthropologist," in which the author epitomizes the stages in the development of the candle and of the lamp. It is only comparatively recently, he says, that the latter has improved beyond a very simple and inefficient contrivance. At present the destiny of illumination is in the hands of the investigator and inventor.

DR. LUNGE ON THE MANUFACTURE OF WATER GAS.*

A Criticism of the Strache Process.

OUR attention has been drawn to an article which Professor G. Lunge has contributed to the latest volume of the important annual publication entitled "The Mineral Industry." The article in question deals with "The Manufacture of Water Gas, with Special Reference to European Conditions," and is mainly an exposition of the Dellwik process of manufacture. Readers of the "JOURNAL" have already been presented with an account of Professor Lunge's investigation of, and views on, this process;† and it is therefore not necessary to refer to them again in detail. But the article before us contains also critical comments on rival processes; and bearing in mind Professor Lunge's eminence as a technological chemist, they cannot be passed over without some notice in our columns.

The article commences with a glance at the discovery of water gas in Europe, the early development of its manufacture in the United States, and the introduction of American processes into Europe about 1880. For a time, the American methods of manufacture were simply copied; and the use of water gas for illuminating purposes made but slow progress in Europe until those methods were modified to suit the altered conditions. Then more rapid progress ensued; but the development was not nearly so great as that which had occurred in the United States. But, according to Professor Lunge, the European development has now followed lines of even greater promise in the direction of the use of water gas for heating purposes. This development has been gradual, however, because, Professor Lunge states, until quite recently the high cost of water gas prohibited its use for general heating purposes—a state of affairs that is now being changed.

Now it is evident from the latter part of Professor Lunge's article, that he has in mind the Dellwik process as the instrument by which the change alluded to in the state of affairs is being effected. The earlier parts of the article review briefly the history of the Lowe and Essen systems of water gas manufacture. These are familiar topics to readers of the "JOURNAL" for a few years past, and need not be dilated upon now. A passing reference to the "improved" Lowe plants, as made by three firms in this country, brings Professor Lunge to the Strache system of water gas manufacture. He states that Strache first attracted attention by the invention of a method which overcame the objection to the use of water gas for the Welsbach light. The brown coating on mantles, which arises from the decomposition of iron carbonyl, can be avoided by removing the carbonyl by passing the gas through red-hot tubes, or by washing it with strong sulphuric acid.

After this reference to Dr. Strache's method of removing the objectionable iron compound from water gas, we learn that:

> Later Mr. Strache directed his energies to the use of bituminous coal, or other cheap fuel, in place of anthracite for the manufacture of water gas. His system, which does not differ in principle from that of E. Blass, and rests equally on a previous treatment of the fuel by superheated steam, is given in the German Patent No. 90,747 of 1895. It has been carried out on a comparatively small scale in Austria, but has not hitherto found any further extension. It seems that in its present shape it does not work unless the coal is mixed with coke. It remains to be seen whether in this, or in some other way, the task of employing cheap fuel for water-gas making will be ultimately accomplished. Then, and then only, water gas will make its way as a general fuel, instead of being limited to special, although very important, purposes.

These remarks call for comment, especially as they are in part contradicted by statements in the recent articles on the Strache water gas installations in the "JOURNAL."‡ The system of E. Blass, to which the Strache system is likened, is evidently one referred to by Professor Lunge in the following terms:—

> A later patent of the Wassergas-Gesellschaft, No. 36,431, 1895 [? 1885], tries to solve the question of using bituminous coal in the generator, in place of anthracite or coke. For this purpose, the blow-up gas is burned in a recuperator; and the heat is utilized for superheating steam, part of which serves for gas-making in the usual way, while the other part is made to pass through fresh coal, and to volatilize the bituminous substances. The gases and vapours thus produced are used either for ordinary illumination or for mixture with the steam in making the blue gas; and they act similarly to fixed carbon for this purpose. The principle of this invention seems to be sound; but it has not found any practical application up to the present time.

This delightfully impartial method of discussion will be observed with mixed feelings by the Strache Companies. In the first place, while Professor Lunge states that the Strache system of manufacture does not differ in principle from the older system of Blass, it must be gratifying to Dr. Strache to be told that the principle of Blass's invention seems to be sound. But if the Strache Companies are now really utilizing the principle, Professor Lunge is scarcely correct in saying that it has not found any practical application up to the present time. It is also incorrect now to say that the Strache process has not found any extension beyond adoption on a comparatively small scale in Austria, although

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* "The Mineral Industry, its Statistics, Technology, and Trade in the United States and other Countries to the end of 1900." Founded and edited by Richard P. Rothwell, and completed by Joseph Struthers, Ph.D. Vol. IX., supplementing Vols. I to VIII. New York and London; The Scientific Publishing Company; 1901.

† "JOURNAL," Vol. LXXIV., p. 819. ‡ *Ante*, pp. 441 and 504.

possibly this might have been substantially true at the time the article was compiled. But a little inquiry would have enabled Professor Lunge to state definitely that the Strache system works with coal without admixture of coke, and prevented him making his present vague statement to the contrary effect. He was probably confused by the fact that it is necessary to use coke when a set is being lighted up. But once the set is in action, coal only can be used continuously.

So far, Professor Lunge does not appear to have studied the Strache process very carefully. He next goes on to say:

> Strache and Jahoda have published* the results of experiments made with the former (? the former's) apparatus, and a long list of calculations based thereon, which are not possible to present in condensed form. The authors lay the greatest stress on burning the gas that is formed during the blowing, and storing up of the heat in a recuperator. The statement made by the Internationale Wassergas-Gesellschaft, Strache's patent,† according to which the Strache system produces from 2·5 to 3 cubic metres of water gas from 1 kilo. of carbon, is so manifestly wrong that it throws a doubt upon the correctness of the other statements and calculations in question. A simple calculation will make this clear. One kilo. of carbon, on direct combustion in the calorimeter, produces 8080 heat units; and beyond this theoretical maximum it is not possible to go, even when the carbon is used for the manufacture of water gas. In fact, in the latter case a deduction must be made of the heat required for raising the steam from 1·5 kilos. of water (1·5 × 954 heat units), leaving only 7126 heat units. Since each cubic metre of water gas yields 2600 heat units, 3 cubic metres (the quantity alleged to be obtained by Strache's process from 1 kilo. of carbon) represent 7800 heat units, which is much more than 7126; furthermore, no allowance is made for the heat lost by radiation from the apparatus and that carried away by the gases. Whether the generation of steam is included or not, a production of 3 cubic metres of water gas per kilo. of carbon is quite impossible; and any representations to that effect render the basis of the calculation entirely fallacious.

With this trenchant criticism, Professor Lunge dismisses the Strache process, and proceeds to devote at least eight times as much space in "The Mineral Industry" to the Dellwik process. We scarcely think this proportion of space reflects the relative importance of the two processes in 1900, notwithstanding the large number of Dellwik plants then erected, or about to be erected. With regard to the figures published by Drs. Strache and Jahoda, these gentlemen are fully competent to defend their results should Professor Lunge's comments be brought to their notice; but writing without reference to the authority quoted by him, we think he has taken an extreme attitude with regard to the statement which he says is made by the Internationale Wassergas-Gesellschaft. In the first place, the statement apparently is that the Strache system enables 2·5 to 3 cubic metres of water gas to be produced from 1 kilo. of carbon—*i.e.*, 40 to 48 cubic feet from 1 lb. of carbon. A little later, Professor Lunge explains that 44·7 cubic feet of water gas should be obtained per pound of carbon by Dellwik's system. Most people will regard this as much the same as the Strache figures which Professor Lunge speaks of as manifestly wrong. It is, perhaps, however, worth while pointing out that the trials of the Strache process, reported in the "JOURNAL" for Aug. 20 (*ante*, p. 443) do not show a higher average yield of water gas than 41·8 cubic feet per pound of carbon. Professor Lunge evidently would not regard this as improbable, as he speaks of a test of a Dellwik plant in which a yield of 41·6 cubic feet of gas per pound of carbon consumed was obtained.

Incidentally, it may be remarked that 1 cubic metre of water gas made by the Strache process does not appear to have so high a calorific value as 2600 heat units, which is the figure adopted by Professor Lunge. Some tests by Dr. Pfeiffer, of Magdeburg, of water gas made by the Strache plant at Ibbenbüren, are recorded in the "Journal für Gasbeleuchtung" of the 14th of September just to hand, and show a mean calorific value of 2533 heat units per cubic metre. The difference is small; but it supports the view that Professor Lunge has dealt as hardly as possible with the Strache process in his criticism of it.

It is unnecessary to follow Professor Lunge further, as the particulars of the Dellwik process which he gives are drawn mainly from papers, by Professor Vivian B. Lewes, Herr Dicke, and others, which have already appeared in the "JOURNAL." It is clear, however, that Professor Lunge is very favourably impressed with the Dellwik process; and it is worth while putting this fact on record, as his opinion carries much weight in technical circles. There is, of course, no question that Mr. Dellwik, aided by his colleague Dr. Fleischer, has done an immense service to the gas industry, not only in elaborating the precise process of water-gas manufacture which bears his name, but also in directing attention to the necessity for scientific control of the "blow" as well as the "run" in all plants in which water gas, whether simple or carburetted, is made. For this service, he has earned the lasting gratitude of all gas engineers directly interested in water-gas production. But, likewise, the laborious researches of Drs. Strache and Jahoda have helped to a better understanding of what occurs within a water-gas generator; and we think that Professor Lunge should have given them more adequate recognition. Mr. Dellwik and Dr. Strache both aim at obtaining the maximum make of water gas from a given weight of carbon; and both endeavour to secure it by preventing loss of heat through the blow gases. The means taken by them to prevent this loss differ; but there is at present no certainty that equally good results are not obtained by the two. Mr. Holgate found that the Dellwik generator did not yield "blow" gases such as would be required to give the high efficiency claimed for the process; while he was favourably impressed with some features of the Strache process.* Herr Körting's study of water-gas processes also did not show that the Dellwik system had any very great inherent superiority to the Strache system.† Hence, while admitting, with Professor Lunge, the great importance of the Dellwik process to gas engineers, we think he should not have treated it as innately superior to all others, without first inquiring more closely into the actual performances of the best of these. We are not prepared to say that the most exhaustive investigation of all the systems would not result in the Dellwik system being found greatly superior; but Professor Lunge's article in "The Mineral Industry" fails to convince us that it is so.

* See "JOURNAL," Vol. LXXVII., pp. 27, 87, 145, 208, 275, and 401.
† "Technische Rundschau," No. 51, 1899.

NATIONAL EFFICIENCY ACCORDING TO MR. SIDNEY WEBB.

WITH the controversies of the party politician, as such, the "JOURNAL" never concerns itself, for obvious and sufficient reasons. With politics in the wider sense of the word—that which pertains to the laws, government, and administration of the nation—we may properly, indeed must, concern ourselves. We do not weep or rejoice when any particular party is in power merely because it is a particular party; what matters to the industry in which our interest lies is that the affairs of the country should be administered, and its laws framed, with wisdom and justice, and that the welfare of the nation should be deemed of greater importance than the interests of any political party. The body of men who most nearly attain to that ideal will always have our honest sympathies, call themselves what they may. The present is assuredly a time when a non-partisan journal, concerned for its country's future well-being, might be allowed to look at some of the factors in the political situation; for party politics are in such a state of flux and confusion, that one might criticize with freedom the doings of either—or rather of any—party without being accused of partisanship, seeing that no one criticizes any party to-day more freely than its own members. We do not, however, propose to speak of the present situation of politics and parties, but only to consider some of the possibilities of the future.

Our thoughts have been directed thither by an article in the current number of the "Nineteenth Century," in which a programme is sketched out for the consideration of the "dark horse" of party politics, by that very able exponent of the Fabian Socialistic theories, and shining light in the firmament of the London County Council, Mr. Sidney Webb, Trade Union advocate and municipalizing zealot. The article bears the curious title of "Lord Rosebery's Escape from Hounsditch"—which is Mr. Webb's polite way of describing the position of the Liberal party—and its whole tenour is socialistic municipalization dressed in as genteel a garb as possible.

The dominant note of Mr. Webb's article is struck when, speaking of the Liberal party as a great instrument of progress engaged in the middle half of last century in wrenching away the political, fiscal, legal, theological, and social shackles that hindered individual advancement, he says that in the present day "its worship of individual liberty evokes no enthusiasm." His gospel is really one of Socialism. He tries to coat the pill, so as to win acceptance for that creed which he knows the public look upon with suspicion, by proclaiming the gospel to be National Efficiency. Let us look at it for a moment in its true light; for Mr. Webb writes brilliantly and plausibly, and his ideas may captivate the unthinking.

Drawing a parallel with the transformation of men's ideas and mental attitude brought about by the discovery of the New World, Mr. Webb would have us believe that we have found a new world of thought in the idea of Communism. According to him—

> We have become aware, almost in a flash, that we are not merely individuals, but members of a community, nay, citizens of the world. This new self-consciousness is no mere intellectual fancy, but a hard fact that comes home to us in our daily life. The labourer in the slum tenement, competing for employment at the factory gate, has become conscious that his comfort and his progress depend, not wholly or mainly upon himself, or on any other individual, but upon the proper organization of his Trade Union, and the activity of the factory inspector. The shopkeeper or the manufacturer sees his prosperity wax or wane—his own industry and sagacity remaining the same—according to the good government of his city, the efficiency with which his nation is organized, and the influence which his empire is able to exercise in the councils, and consequently in the commerce, of the world. Hence the ordinary elector, be he workman or manufacturer, shopkeeper or merchant, has lost his interest in individual "rights" or abstract "equality," political or religious. The freedom that he now wants is not individual but corporate freedom—freedom for his Trade Union to bargain collectively, freedom for his co-operative society to buy and sell and manufacture, freedom for his municipality to supply all the common needs of the town. . . . In short, the opening of the twentieth century finds us all, to the dismay of the old-fashioned Individualist, "thinking in communities."

Fortunately, Mr. Webb's hyperbolical "all" (from which, it is to be supposed, he excludes the poor despised Individualist) is very wide of the truth, if he would have his readers believe that we "all" are to be classified with his "ordinary elector," whose one ambition is to be allowed to do nothing for himself. What

* See "JOURNAL," Vol. LXXVII., p. 1206. † *Ibid.*, pp. 1125, 1223, 1310, 1377.

a picture is set before us of what goes to constitute an efficient nation! A nation, we have always understood, consisted of individuals; and the more efficient the individual, the more efficient the nation. But no. The workman is not to feel that his progress depends wholly, nor even mainly, upon himself. Never mind whether he does a fair day's work or not, the Trade Union will see he gets a "fair day's wage," and the factory inspector will see he is not overworked. The shopkeeper and the merchant need not delude themselves with the idea that business ability, enterprise, and industry can make their fortunes. If the municipality do not take over all the shopkeepers' trades, they cannot expect to flourish; if the Government are not obtaining concessions for the manufacturer abroad, he must not expect to do business with foreign countries. Is that, we would ask, how the enormous volume of England's commerce has been built up and maintained—by the influence which the Empire has been able to exercise in the councils of the world? The suggestion is, indeed, a putting of the cart before the horse. It is the enterprise and success of the individuals comprising the nation that have placed that nation in the position it occupies. The men who made our Colonies were not municipal employees or civil servants.

Mr. Webb would, then, have the nation believe that what is wanted to secure efficiency in its management, and a maintenance of its commercial position against the assaults of its competitors, is not greater individual training and fitness, but a casting on one side of that which has been the mainspring of its success—the free play of individual enterprise. For the working out of his ideal, he does not look to the effete, old-fashioned Liberal party (which had something to do with the building up of the commercial prosperity of the country). He admits that it would be hopeless to expect them "to turn over a new leaf, and devote themselves to obtaining the greatest possible development of municipal activity, the most comprehensive extension of the Factory Acts, or the fullest utilization of the Government departments in the service of the public." That is, in brief, the gospel of National Efficiency according to Mr. Sidney Webb, who tells us that "what hinders the formation of a separate Socialist party in England is always that the increase of Socialism is so much faster than that of professed and organized Socialists." A rather curious explanation, and one that will not be generally accepted.

One of the main planks in the National Efficiency platform is to be our old friend the Living Wage. "The statesman who is really inspired by the idea of National Efficiency will stump the country in favour of a 'National Minimum' standard of life, below which no employer in any trade in any part of the kingdom shall be allowed to descend." The same minimum standard, be it observed, for the Irish peasant or the Scotch crofter as for the city labourer. "He will elaborate this minimum of humane order—already admitted in principle in a hundred Acts of Parliament—with all the force that eloquence can give to economic science [as expounded by Mr. Sidney Webb] into a new industrial charter, imperatively required, not merely or even mainly for the comfort of the workers, but absolutely for the success of our industry in competition with the world." (Observe the elaborate coating of the pill.) "With the widespread support which this policy would secure, *not only from the whole Trade Union world*, but also from . . . even the enlightened employers themselves, he would be able to expand our uneven and incomplete Factory Acts into a systematic and all-embracing code, *prescribing for every manual labourer employed a minimum of education, sanitation, leisure, and wages* as the inviolable starting-point of industrial competition."

That is the first item in the model programme. Another is Municipalization *in excelsio*. "The King might give a 'Shield of Honour' to the local authority which had made the greatest progress in the year, together with a Knighthood to the Mayor, and Companionships of the Bath to the clerk, the engineer, and the medical officer of health." And what to the poor ratepayer? He will, of course, be consoled by the knowledge that his money is being spent by a Knight and by Companions of the Bath. In order to encourage municipalities to be extravagant, it is further proposed to extend the system of grants-in-aid—to so arrange matters that a separate grant could be made "in aid of each branch of local administration which it is considered desirable to promote, not only for police and schools, but for such humdrum but fundamentally important services as roads and bridges, paving and lighting, water supply and housing, baths and washhouses, parks and libraries." What a magnificent idea! Remove as far as possible the subscriber of the money from him who profits by its expenditure—let him who spends owe no responsibility to him who pays. Let the income-tax payer bear the cost of the ratepayers' gas, electric light, or water. It is almost worthy of "Alice in Wonderland."

This is the programme of National Efficiency dangled ostentatiously before Lord Rosebery's eyes—with judicious approval of the war in South Africa added, to give attractive colouring—and the party that is to carry it into effect under his leadership is to be a sort of glorified Progressive party (Spring Gardens style). "Lord Rosebery is struck by the repeated electoral successes of the Progressive party in the London County Council. But these successes were not gained by any enunciation of general principles. . . . They were, as Lord Rosebery knows, won by a persistent and all-pervading propaganda of a detailed programme of reform in every department; resolute, and even extreme in its character; put forward by a group of men who had definitely thought out what they intended to get done."

Well, Mr. Webb has told us what he wants to get done; but we very much doubt if he will find Lord Rosebery, or any other senior statesman, prepared to try to do it for him. Assuredly if any one does seriously try, he will find the common-sense of his fellow countrymen an insurmountable barrier. Party politics may be in a state of chaos; the need of the nation for more efficient administration may be very great. But the country will not look to the Spring Gardens type of statesman for the leader of a new party, nor to socialistic municipal faddists for efficient administrators.

ELECTRIC LIGHTING MEMORANDA.

Electrical Engineering at the Glasgow Conference—English and American Electrical Engineering—Continental Superiority—Extra High-Pressure Regulations.

BRITISH electrical engineering did not take a very prominent place in the proceedings of the Glasgow Engineering Conference, for the same reason that has operated to eclipse the native electrical exhibits in the Glasgow Exhibition. What this reason is was proclaimed uncompromisingly by Mr. Mansergh, in the course of his address to the conference. The Electric Lighting Acts condemned the nascent industry to which they were applied, to the strictly parochial needs of local authorities. There is the excuse for the framers of these laws and the Parliament that passed them, that nobody suspected at the period how the new business was destined to grow. Besides, it was at the outset so infested with financial parasites, that there was reason for grave doubt as to whether these would not kill it. Instead, the legislation destroyed the parasites; but the patient barely survived the heroic treatment. The net result of all these vicissitudes is plainly visible in the comparatively poor show made by British electrical engineers at Glasgow. The Electrical Section of the Congress was presided over by Mr. W. Langdon, President of the Institution of Electrical Engineers, who gave an address in which, by a remarkable coincidence, Mr. Mansergh's point was illustrated and driven home by a formidable citation of evidence. He admitted that, in matters electrical, England has not retained the prominent position which has heretofore distinguished this country. Twenty years back, British manufacture stood on the same level with other countries in the production of electrical machinery; yet since then we have from some cause failed to meet even the home demand. Mr. Langdon went on to compare British enterprise in this department with that of the United States, to the disadvantage of the former. But this is not the proper way to look at the subject, as we shall briefly show.

It is all very well to state that the capital investment of the United States in electric lighting, power, and traction works amounts to £200,000,000, as against England's £35,000,000; but the figures are not equally trustworthy. There is an enormous amount of water ballast in the American flotation. Wild as was the electrical speculation in this country in the "eighties," it was a trifle to that which raged in the United States at the same period. And whereas all our inflated Brush bubbles long since burst and were cleared away, the system of Trusts in the United States has kept much of the capital similarly wasted there, upon a dividend-earning basis. It is not to be held for a moment that the actual state of electrical engineering in the United States is one whit better than it is in England; but the Americans have for the time being more experience in doing things on a large scale. Against all the big figures that can be adduced, with some show of verisimilitude, to support the popular notion that the United States is so much ahead of poor old England in all matters electrical, let it suffice to pose one bit of hard fact. We have in London underground railways which it is proposed to convert from steam to electric traction—in one case upon an American pattern. There is a railway tunnel in New York, of which even harder things are spoken than of the London Metropolitan lines. A New York grand jury recently recommended that this tunnel should be worked only by electric traction; and the unanimous reply of the railway companies using it in common was that "it could not be done." How is that for the boasted pre-eminence of American electrical engineering?

It is the Continental competition that makes British electrical engineering look so behindhand. Germany had not the disadvantage of being exploited by the Brush and other American electrical freebooters, but trusted in her Siemenses, Schukerts, and Ganzes; and these firms remain in the front rank of the procession, where they have been joined by many others. We might have done the same, but did not. Instead, our electrical engineering firms played about with electric heaters. and egg-boilers, and such-like toys. The only English electrical engineer with ideas as wide as the subject demanded, was Mr. de Ferranti; and he has not an English name. He was treated as true pioneers generally are treated, in this country. English electrical engineering has throughout been a donkey-engine business, overrun by men anxious to bag commissions from small local authorities, which were usually obtained on pretence that local electric lighting would help the rates. The result is that Schukert and Ganz and Siemens can beat British manufacturers when it comes to big work, except in the manufacture of cables.

The name of Mr. de Ferranti crops up incidentally in connection with the subject of the Board of Trade regulations for the extra high-pressure electric mains which will be wanted if the

various electricity "in bulk" generation ventures are to pay. For it was he who years ago ventured to send electricity from Deptford into London at the then unheard of pressure of 10,000 volts, through underground cables. The subject has not been followed up until recently, when it was revived for the reason above stated. Electricity generation in bulk is not going to be any great "catch," unless cheap distribution can be worked in conjunction with it; and doubts appear to have arisen—rather late in the day, one would think—as to the view the Board of Trade are likely to take of their responsibilities in this connection. Consequently, the Electrical Section of the London Chamber of Commerce have bestirred themselves with the laudable object of forcing the Board of Trade to systematize the departmental regulations in regard to these high-pressure transmission systems. The section of the Chamber doubtless means well; but it is needlessly interfering with a matter that does not directly concern it. The Board of Trade are not going to be hustled into sanctioning anything rash, nor into tying the hands of the officers of the Department by formulating general directions which the first concrete case may show to be mistaken in some particular. The responsibility that rests upon the Board in this regard is so heavy that the advisers of the Department must not be worried about hypothetical requirements.

THE BRITISH ASSOCIATION AND EDUCATION.

THE facts that the educational methods and facilities of this country are by no means efficient or sufficient, and that some decided improvement in these respects is urgently called for by the growing stress of industrial competition, are sinking slowly but steadily into the minds of the general public. The process of arousing that slow-moving entity to any real interest in the subject—to interest sufficiently keen to produce action—is sure to be a long one, for the English people as a whole are not enthusiastic believers in systematic and sustained courses of education. The English boy looks upon education as at best a necessary evil, from which the attainment of "young manhood" will release him for ever; and he maintains that attitude more or less decidedly, if unconsciously, throughout life.

A considerable step in the direction of educating the public in the importance of providing the best designed and best equipped system of training for the generation that is to undertake in the future the burden of the nation's vast commercial and industrial enterprises, has been taken by the institution of a new section of the British Association devoted to the discussion of educational matters. There is, of course, always the fear that such steps may lead rather to talking of how things are to be done than to the doing of them; but it is to be hoped that if, as in the case of the first year's proceedings of the section, the discussions are confined rather to practical than to theoretical matters, much may be done to correct and instruct public opinions upon the educational needs of the country, and to obtain considered, rather than hasty and misdirected, reforms.

Sir John Gorst's presidential address was a worthy commencement of the proceedings of the section. The Vice-President of the Council showed a very clear appreciation of the fact—not always recognized by the official mind—that a national system of education, especially in the higher branches of secondary and technical instruction, has drawbacks as well as advantages, and by no means inconsiderable drawbacks too. The most serious danger is the tendency for the national system to suppress and absorb all the other agencies, however long established, however excellent their work, and to substitute one uniform mechanical system, destructive alike to present life and future progress. This is a drawback felt even in the field of primary education; the courses of instruction best suited to children dwelling in large industrial centres and to those in agricultural districts being obviously different. But if that be so as regards the elementary stages, how much more is it the case when we come to deal with secondary and technical instruction? Variety, flexibility, adaptability are of their essence. Sir John Gorst shows himself very fully aware of this necessity for avoiding mechanical uniformity; and, as he says, there is reasonable hope that in this country—with its ancient system of public and private schools and universities, quite independent of the Government—this peril may, with proper care, be escaped. But, he adds, the existence of the peril must not be forgotten. "Universal efficiency in all establishments that profess to educate any section of the people may properly be required; but the variety, the individuality, and the independence of schools of every sort, primary and secondary, higher and lower, should be jealously guarded. Such attributes once lost can never be restored."

The field of secondary education—defined by Sir John as that division of higher education which is directed to the pursuit of knowledge for its own sake, whereby the scholar and votary of pure science are evolved—is already largely occupied by public or private enterprises, which might well be assisted, but must not be suppressed, by the nation. It is the field of technological training, wherein the craftsman and designer are produced, that is most barren, and which, therefore, offers most scope for the activities of public authorities; while the very variety of the subjects included within its boundaries is a safeguard against the danger of mechanical uniformity. Two things must, however, be borne in mind. One is that it is impossible to build the upper structure until the foundation is securely and truly laid, and that, therefore, it is but waste of public money for courses of technological instruction to be provided except for those qualified to benefit thereby. As Sir John truly says: "Science cannot be taught to those who cannot read, nor commerce to those who cannot write. A few elementary lessons in shorthand and book-keeping will not fit the British people to compete with the commercial enterprise of Germany. . . . In such institutions as the Polytechnics at Zurich and Charlottenburg, we find the students exclusively drawn from those who have already reached the highest branches of general education. In this country . . . boys are entered at technical institutions whose . . . intellectual faculties have not been developed to the requisite point, and who have to be retaught the elements to fit them for the higher instruction."

The wasting of public funds upon teaching those incapable of really benefiting by the instruction must then be guarded against. That is one thing to remember. The other is that what is needed is a scientific, well-thought-out, coherent system of technical instruction—not a crop of mushroom classes and schools suddenly brought into being and founded upon no proper plan, as a consequence of periodical panics, induced by alarmist reports, as to our backwardness in some particular branch of commerce or industry. It has been made clearly manifest that it is useless to look to the Government for the institution of such a system as is needed, unless the driving force of public opinion is urgently applied; and it is by way of helping to create such driving force that the new Education Section of the British Association will do good service. We wish more power to its elbow.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 798.)

BUSINESS on the Stock Exchange last week was very much restricted in the aggregate; and the volume was effectually reduced by the closing of the Exchange on Thursday. Movements were extremely irregular; for while the American Market (which was the only active one) was very buoyant, many of the rest were inclined to be flat; and the disagreeable news from South Africa had the effect of putting Consols down. In the Money Market, even more pronounced ease was the characteristic. There was hardly any demand, and bankers had great difficulty in disposing of their balances. In the Gas Market, there was no lack of business; but it moved in very narrow lines, and was confined almost entirely to one or two of the leading stocks. The tendency was good throughout, without any variations; and changes of quotation, though neither numerous nor considerable, are all in the upward direction. Of the Metropolitan undertakings, Gaslight ordinary was most unusually active, transactions on one or two days being to an extent that has very seldom been exceeded; and the price gradually hardened until it closed at 97¼, with an advance of a point in the quotation. A moderate amount only was marked in the secured issues, which were steady, especially the debenture stock. It is understood that the Company succeeded in disposing of the £100,000 balance of this stock which was recently offered at a minimum of 90, realizing a little above the limit price. South Metropolitan was a little more active than it had been of late, and seemed inclined to advance a point; but it could not quite manage it. Nothing at all was marked in Commercials. Some half-dozen bargains were all that was done in the Suburban and Provincial groups; but everything was steady. Alliance 10 per cent. had a nice advance; and in the local market Liverpool debenture was fractionally tightened. Among the Continentals, Imperial was fairly brisk, and left off a point higher. In the remoter world, the debentures of Melbourne and Cape Town had a rise apiece. In the Water Companies, the steady advance in values which has been in progress now for some weeks made further strides; and several issues were able to improve upon their opening quotations.

The daily operations were: Gas was extremely active on the opening day, Gaslight and Imperial having the best of it; but prices did not change. Things were decidedly quieter on Tuesday; but the strength was unimpaired. Alliance advanced 1. In Water, Kent and Southwark improved 2 each. Wednesday's operations were only moderate; but quotations were on the rise. Gaslight ordinary, Cape Town bonds, and Melbourne 4½ per cent. bonds rose 1 each. In Water, Lambeth and Southwark advanced 2 each, and Grand Junction 1. On Thursday, the Exchange was closed. Friday was fairly active and strong. Imperial rose 1. In Water, Kent and Southwark rose 1 each. Saturday was a very quiet day; and the only move was a rise of ½ in San Paulo.

Eastern Counties Gas Managers' Association.—The arrangements for the 26th general meeting of this Association (which is to be held at Cambridge on Thursday of next week, under the presidency of Mr. Richard Brown, the Engineer and Manager of the Cambridge University and Town Gas Company) include the reading of two papers, besides the President's Inaugural Address. The papers to be read are by Mr. W. J. Carpenter, describing the coal storing and stoking machinery at the Great Yarmouth Gas-Works; and by Mr. E. W. Smith, of Chelmsford, on "Improvements in Carbonizing during Recent Years." It is proposed to elect six new members to the Association; and in the evening there will be a dinner at the Lion Hotel.

PERSONAL.

Mr. R. T. Bevan has been appointed to the vacancy in the auditorship of the Commercial Gas Company, occasioned by the death of Mr. A. G. Hounsham.

Mr. D. H. Anderson, formerly of Cagliari, has succeeded his brother, Mr. G. W. Anderson, as Secretary and Manager of the Caterham and District Gas Company—the latter gentleman going to Buenos Ayres, as notified some weeks since.

Professor James Dewar is the President-Elect of the meeting of the British Association in Belfast next September. As his lines are laid in branches of science in which readers of the "Journal" are more or less concerned, they will look to his address yielding a substantial amount of new material.

Mr. Harry Dix has been selected for the post of Works Manager of the Cray water scheme of the Swansea Corporation, which office has been created in consequence of the Corporation having taken over the work from the late contractors. Mr. Dix has had a varied experience in the construction of new works; and the salary he asked is £600 per annum. In the voting, Mr. E. J. Jones, of Neath, tied with Mr. Dix; but the Mayor gave the latter his casting vote.

At a meeting of the Conservative members of the Bolton Town Council, held last Friday, it was resolved to recommend Alderman John Miles, J.P., to the Council for appointment as Mayor of the borough for the ensuing municipal year. Mr. Miles—as many "Journal" readers are aware—has been a member of the Council for 27 years (during which time he has served as Chairman of the Gas Committee with conspicuous success), and has held the chairmanship of the Board of Guardians. He has also filled numerous other public offices in the town.

OBITUARY.

We regret to learn that last Wednesday, Mrs. Henry Smythe, the wife of the Engineer and Manager of the Maidstone Gas Company, died at her residence, "Bella Vista," Maidstone, aged 47 years.

Mr. T. T. Marks, of Llandudno, died last Thursday, after a lingering illness, at Plas Myrddin. Combining business with a quest for improved health, the deceased gentleman last year went to Capetown to act as Consulting Engineer with reference to the development of a budding resort outside that place; but it was evident, upon his return home, that he had not greatly benefited by the change. Mr. Marks, who was in his 57th year, was a native of Carnarvon, and at an early age went in for engineering. His first public position was under the Swansea Corporation. In the year 1870 he was appointed Borough Surveyor of Lowestoft, which he held for six years, after which he was elected out of 112 candidates to the post of Clerk and Engineer to the Llandudno Board of Commissioners; and it was under the *régime* of the Commissioners and the direction of Mr. Marks that many important schemes were effected—more especially that for supplying the town with water from Dulyn. He resigned office in 1891, and went into private practice. He was an associate-member of the Institution of Civil Engineers; was one of the ten engineers who founded the Institution of Municipal Engineers and Surveyors in 1872; was a Fellow of the Royal Meteorological Institution; and was on the Management Committee of the Benevolent Fund of the Gas Institute, which he joined in 1879.

Mr. Edward Thomas Edmonds Besley, K.C., died at his residence, Sydenham Hill, on Wednesday, after a few hours' illness, in the seventy-sixth year of his age. He was brought up as a journalist in 1851, came to London, and became a parliamentary reporter. He subsequently studied for the Bar, and was called in June, 1859. The deceased gentleman was largely interested in commercial and other undertakings, and was a Director of the Lambeth Water-Works Company, and of the Commercial Gas, European Gas, and Hornsey Gas Companies. The "Daily Telegraph" remarked that "a prominent figure disappears from the Central Criminal Court, where for 30 years his portly presence was conspicuous among the barristers who practise there. In early life Mr. Besley became a reporter in the gallery of the House of Commons, where he had the good fortune to obtain the approval of Mr. Disraeli for the way in which he reproduced several of that orator's speeches; and shortly afterwards he blossomed into a barrister. But almost until the last he maintained an indirect connection with the Press. At the Central Criminal Court, and at the Sessions, Mr. Besley soon obtained a large practise, and proved as ingenious in conducting defences as Sir Harry Poland was in prosecutions. Sometimes when old-convicted prisoners found that they could not have Mr. Besley to defend them, they pleaded guilty—in the hope that, by saving the time of the Court, the Judge would let them off lightly. His eloquence may not have been forensically perfect; but it was always effective with juries. Some years ago he 'took silk;' and that event practically ended his career as a barrister."

The Feilden Publishing Company announce the publication in book form, price 5s., of the interesting series of articles, entitled "Modern Appliances in Gas Manufacture," which Mr. Fletcher W Stevenson recently contributed to "Feilden's Magazine."

COMMUNICATED ARTICLE.

LEWIS THOMPSON AND THE EARLY DAYS OF GAS LIGHTING.

By W. J. Warner.

The very brief notes of mine upon the labours of Lewis Thompson* were directed to their influence on the commercial position of gas undertakings at the time of his most active work; but attention was chiefly directed to the illuminating power of the gases and their relative money values. His labours, however, were not confined to gas as an illuminant; they were extended, as noted, to the calorific powers of the several gases tested. They were continued over the lengthened period of nearly a year and a quarter, and are, therefore, valuable and interesting; but very possibly they were of most interest and value at the time they were given to the gas profession through the columns of the "Journal."

The experiments were commenced in May, 1852, and were continued to the June of the following year. The full year, however, from July to the following June, has only been taken for this article; and the workings are summarized for comparison into the average of the four quarters, thus covering all changes of weather and the varying makes of the several seasons. The results are those from the three Companies brought under examination. The lowest is exclusively one of the three, and was subsequently amalgamated with the Chartered; and this Company's gas gave not only the highest result of the whole of the tests—2964 grains—but could be placed above the whole of the averages, as will be seen by comparing with the following table.

Grains of Water Evaporated by One Cubic Foot of Gas Burnt at the Rate of 10 Cubic Feet Per Hour.

1852.	Highest.	Lowest.	Average.
July, August, September	2839	2693	2771
October, November, December	2792	2640	2739
1853.			
January, February, March	2925	2812	2825
April, May, June	2872	2631	2765

These results were from the testing of the London Gas Companies on the Middlesex side of the river only. It was not till February, 1854, that the South Metropolitan and the other Companies on the south of the river appointed a Gas Tester (Mr. Warrington) for their districts. Dr. Letheby was appointed Chemist to test the gas, by the City of London, in March, 1852.

Parenthetically, I now make good the omission of a paragraph which ought to have been given in my last communication. It is from a very elaborate article, entitled "Some Observations and Experiments upon the Comparative Value of Coals for the Manufacture of Gas," by Thomas G. Barlow, in the "Journal" for April, 1851—

> Till within the last few years "illuminating power" was a term almost unknown in reference to gas, except to the engineers and managers of the gas-works of the large cities of the empire, and to a few scientific persons studying and taking an interest in questions connected with artificial light. The first legislative application of the knowledge that differences *did* exist in the light afforded by equal volumes of different descriptions of gas, appears in the Taunton Gas Act of 1845. In the Liverpool Gas Amalgamation Act of 1848, a quality clause was also introduced for the purpose of preventing any return to the use of gas of inferior quality extracted from common caking coal. In the following year the Great Central Gas Consumers' Company proposed the adoption of a quality clause.

To return to the subject of the heating power of coal gas, as given in the tables, we are not informed as to the details of the experiments conducted by Lewis Thompson; nor can a description of the apparatus used be found. In his first communication, "On the Illuminating Power of Gas in the Metropolis," he says: "The calorific power of the gas is determined very simply by the actual weight of water boiled off during the consumption of each cubic foot. The result, therefore, is a practical one, and applies to each gas when burnt at the rate of 10 cubic feet per hour." This was supplemented by the following, in August, 1852: "The calorific power is represented by the number of grains of water which 1 cubic foot of gas will practically distil when the gas is burnt at the rate of 10 cubic feet per hour."

In the opening chapter of "The Chemistry of Gas Lighting," in the "Journal" for October, 1851, he says:

> From the rapidly-extending use of gas as a culinary agent, it is intended to devote a portion of our space to the recital of experiments made with the calorimeter, for the purpose of showing the relative heating powers of different gases, both in respect to bulk and weight. The calorimeter to be used is one of a very simple construction, having some resemblance to the worm of a common still, deeply immersed in water. Through this worm, the heated air arising from the gas in combustion is permitted to travel slowly, so as to become deprived of its surplus heat; and the water surrounding the tube or worm is cooled down exactly as many degrees below the existing temperature of the room in which the experiment is made as it is intended to raise it above that temperature. By this means the compensation needed for radiation is done away with, since it is fair to infer that as much heat will be absorbed at the commencement of the experiment as is given off at

* See *ante*, p. 650.

the conclusion, especially with a uniform current of gas burning at the jet.

A few months previous to the publication of this, there appeared in a "Communicated Article" to the "JOURNAL," by Mr. J. O. N. Rutter, the following: "Everything connected with gas is in motion, and is likely to keep moving. Its value is at last beginning to be understood." Of this movement the Association of Gas-Fitters had taken cognizance. The Committee of the Association, which had been formed some time previous, issued an advertisement, early in 1851, for assistance to carry out a resolution which had been passed by the Association to have a public exhibition of gas apparatus during the time the Great Exhibition was open. The cause which led to this resolution, and its objects, are set forth in the first advertisement—

The Committee of this Association, established to create a favourable public opinion for the more general introduction of gas, have received, in reply to a communication sent to the Commissioners for the National Exposition, an intimation that no gas apparatus in practical operation can be shown. It is obvious no interest attaches to the mere inspection of a gas cooking-stove, burner, or indeed any novel application of gas, unless seen in actual operation. . . . Arrangements have been made . . . for the exposition in full operation of any apparatus embracing a novel application of gas, either for culinary, heating, chemical, or manufacturing purposes, or for the illustration of improvements in burners, lighting, ventilation, photometers, governors, or meters.

The Committee had daily practical illustrations of the advantages and of the use of gas and its adaptation to the requirements of daily life. Lectures were also given in the various districts of London. Also a prize essay was, by arrangement, written by Lewis Thompson, "the most eminent Gas Chemist of the day." The following is from the essay, which was "On the Nature and Chemical Properties of Coal Gas, considered with respect to its Economical and Sanitary Application for the Purposes of Generating Light and Heat." (July, 1854.)

After having commented upon the comparatively small amount of heat generated by the combustion of coal gas as an agent of illumination, it may seem singular that I should now proceed to speak of its value as a source of heat or caloric. But the circumstances of my first argument were based upon a limited standard of photometrical power, and confined to a simple comparison with other substances specifically described; whereas my present inquiry bears altogether upon a calorific standard, and goes no further than to a partial comparison with one kind of fuel. In short, what I wish to convey is, that for some temporary purposes, gas, at the present London prices, is cheaper than coal as a fuel. But by this I in no way advance the general proposition that gas as a fuel is cheaper than coal as a fuel; for that is true only under some peculiar circumstances, which I will now endeavour to point out. Thus, where a fire is needed hastily, and for a temporary purpose, gas will always be cheaper than coals—as in heating water for a bath, or in small culinary operations. Again, where a moderate fire of great uniformity is required to be maintained for many hours or days, the cost of gas will be less than the mere extra cost of attendance with coals; and the same thing holds good in many other cases. Foreseeing that questions of this kind must one day force themselves upon public attention, I have made many experiments of a practical kind, in order that some fixed data may exist to constitute, as it were, the nucleus of future and more valuable results. My mode of proceeding has been to determine how much it costs to raise a gallon of water, contained in a copper kettle, to the boiling-point, by means of a recently lighted fire in the one case, and by means of a small gas-stove in the other. The average result of 36 experiments with each of these sources of heat has been as follows:—

	Coal Used.	Wood Used.	Time Employed.	Total Cost.
With fire . .	4½ lbs. ..	⅛d. ..	1 hour ..	$\frac{7.7}{100}$ of 1d.
With gas . .	4 cubic feet at 4s. 6d. per 1000 ..		20 minutes ..	$\frac{7.5}{100}$ of 1d.

So that there is an economy in price of nearly 3 per cent., a saving in time of two-thirds, by the use of gas—to say nothing of the cleanliness and comfort thus secured.

The foregoing extracts are chiefly those bearing upon the comparative thermometrical and economic values of coal gas. There is, however, another and a more important matter which had to be dealt with in those early days of gas lighting—the salubrity of its general use. This, to say the least, was handled in the same skilful, masterly way as that of the illuminating power. Not a point is lost in dealing with subjects that, by his treatment, could be comprehended by the public. He dealt frankly with the public, too, admitting what could not be remedied by the manufacturer; but he told them what the consumers ought to have, and that through the Official Chemist, Dr. Letheby. Thus we find, in July, 1853, Lewis Thompson writing: "I cannot help remarking upon the inconsistency of Dr. Letheby, in commenting continually upon the pretended huge evil arising from sulphuret of carbon, when he altogether omits to notice the real one caused by the presence of carbonic acid in one of the gases. Even if sulphuret of carbon were ten times as obnoxious as it is, still if no practical means can be devised for its removal from gas, what is the use of harping on this dreary string with such painful pertinacity? When once produced, it cannot be got rid of; and nothing but low heats will prevent its production. With carbonic acid, the case is very different. It may, and ought to, be removed, and is consequently a superfluous and unnecessary impurity in coal gas." "The public reads my reports with no common attention, and acknowledges, as I know very well, their truthfulness." Came this not from his previous labours?

In September, 1852, he asks: "Why is that poisonous and baneful substance allowed to remain in the . . . gas, when a few bushels of lime would remove it?" In the following month, he makes the assertion that he is "in a position to show that gas can be completely and thoroughly purified ere it is sent out to the public." And so, in the same letter, we find that he speaks from his experience, of the fact that his examinations of the gases have been such as to justify the assertion without any qualification: "Of the gas from the Chartered Gas Company, I am able to speak in the very highest terms of commendation. During the whole month, it has been irreproachably pure; not the slightest indication of carbonic acid has ever appeared." In June, 1853, we find him calling to task the son of the great Samuel Clegg, as follows: "*Apropos* of the carbonic acid, I perceive that Mr. Clegg, junr., in the late edition of his work, entitled 'A Practical Treatise on Gas,' expressed an opinion that carbonic acid in small quantity does no harm to gas. But 1 per cent. is not a large quantity; and yet 1 per cent. of carbonic acid diminishes, according to my experiments, the illuminating power of a gas from 8 to 10 per cent., and therefore compels me to burn more gas, and, by thus generating additional carbonic acid, to vitiate the air of my apartment nearly 10 per cent. more than if that 1 per cent. of carbonic acid gas did not exist in the gas. Is this doing no harm in a room 10 feet cube?"

Thus it was that the ignorance and prejudice of the time were fought against by Lewis Thompson; and thus was greater service rendered to the gas undertakings than by his labours in fixing the conditions of a standard of commercial value. Matters of economy were of little moment to the class of consumers that was at that time desired; but the purity had to be unquestionable. It was not a low type of ignorance that had to be combated; it was the higher, and, though better educated, yet more deeply prejudiced class of society which had to be convinced of the innoxiousnes of coal gas. Here is an instance: "My attention," says a writer in the "JOURNAL," in November, 1854, "has lately been directed to the subject of gas lighting by a personal friend, who is desirous of having his house lighted by gas, but whose wife entertains a great dread of its introduction into the house. Her opinion, hitherto founded upon popular error as to its unwholesomeness, ultimately became firmly rooted on hearing of Dr. Letheby's statement that wherever gas is burned in an apartment, the air becomes contaminated with oil of vitriol." But in the April previous, Lewis Thompson wrote: "As both your readers and the public at large are now fully convinced of the baseless nature of Dr. Letheby's vitriolic accusation, it is unnecessary for me to do more than state that, with the kind assistance of several friends, I have, during the last month, consumed, as the public consumed it, upwards of 8000 cubic feet of gas, and collected upwards of 40 gallons of condensed water, without being able to obtain the slightest trace of oil of vitriol from this huge bulk of fluid."

In all these extracts—and many others could be given, or what may well be said to be communications from Lewis Thompson to the public and the gas profession jointly—sufficient was advanced to convince the one and to prompt the other to labours in the same cause. All, as Rutter said, was in motion—lecture after lecture was given by gas engineers; pamphlet after pamphlet was issued. Thackeray had written of the tallow age; this was the age of cooking and heating by gas, as well as of gas illumination. Much was said and written about the science of gas lighting; but it was (if really a science) often at fault—see the oil of vitriol discoveries of Letheby, and the clay purification of Bowditch. To this question of the removal of the bisulphuret of carbon, reference has been already made; but we may turn to this subject again with much interest. "Some Observations on the First Report of the Chemical Referee" is the title of a communication by Lewis Thompson, in June, 1852; and the following is an extract: "If Dr. Letheby had wished to investigate the purity or impurity of the gas, he ought to have attended most minutely to the quantity of bisulphuret of carbon contained in it; for this is, after all, the only thing in ordinary coal gas worth calling an impurity. But it so happens that not one word is said in the report about bisulphuret of carbon."

Again, in December of the same year (1852), in "The Chemistry of Gas Lighting": "Of late it has been found convenient by certain parties to regard ammonia and sulphuretted hydrogen as the only impurities requiring removal. . . . Against so absurd and dangerous a doctrine, we strongly protest." Then, further on, it is said: "We have no hesitation in declaring the complete and perfect purification of coal gas to be an utter impossibility, in a practical sense, without the free use of lime." Compare what is quoted above (June, 1852) with the following from Dr. Letheby's ninth report: "Although much attention has been directed to the purification of gas from one or two of its impurities, little or no notice has hitherto been taken of the most important of all—namely, bisulphuret of carbon" (June, 1854). The reply to this is given in the same issue of the "JOURNAL," by Lewis Thompson. It is as follows: "That some attention has been paid to purification from bisulphuret of carbon, I can myself bear witness, for I was employed three or four years ago by George Ramsay, Esq., of Newcastle-on-Tyne, and Mr. Wright, of the Western Gas Company, to make an extensive series of experiments with that view; and I did make upwards of 3000 experiments upon more than 1400 different salts and metallic oxides—from the sulphuret of sodium and the permanganate of potash, to the oxides of platinum, gold, and palladium. But, for one reason or other, all of them were practical failures. I also know that Mr. F. J. Evans,

of Westminster, Mr. Laming, of Millwall, Mr. Wright, of Kensal Green, and, I believe, Mr. Hills, of Deptford, have been long and assiduously engaged upon the same subject. 'No notice,' indeed! but this is of a piece with the usual style of assertion. If ever a means is discovered by which, without injury to the gas, bisulphuret of carbon can be completely removed from it, this will not be, I am sure, the result of chemical reasoning, but of some instinctive accident."

TECHNICAL RECORD.

CROSS'S COMBINED COAL-SCREEN AND COAL-BREAKER FOR INCLINED RETORTS.

In our "Register of Patents" to-day (p. 791) there appears an abstract of a specification filed last year in the name of Mr. F. W. Cross, Assoc.M.Inst.C.E., Engineer and Manager of the Lea Bridge District Gas Company. The reproduction of the patent drawings which there appears may be usefully supplemented by the photographic view Mr. Cross has been good enough to hand to us, showing the top of the coal-hoppers with the tip waggons and screen he employs at his works at Leyton.

In the words of the specification: "The invention relates to a combined apparatus for controlling the size of coal and providing facilities for the breaking of the larger lumps of coal to a size suitable for inclined retorts, and consists of an iron or steel screen having a definite size of mesh with four angular points, one on either side of mesh, upon which points the coal is broken."

The inventor when proposing to erect a setting of inclined retorts was not singular in raising many objections to the mechanically operated bucket elevator for raising coal to the hopper floor of the setting; and the result of his objections was the devising of plant consisting of a simple hydraulic lift operating between the level of the coal-store and hopper floor. A double line of rails is laid through the coal-store, upon which are run tip-waggons to hold about 10 cwt. each. These waggons are filled with coal, run on to the lift, elevated to the hopper floor, and from the lift are conveyed along another set of rails running alongside the coal hoppers.

It was at this point that the inventor met with a check, in that, with the varying qualities of coal with which he was working, a quantity would require breaking to a suitable size for the inclined retorts, and he had several objections to raise against the use of mechanical coal-breakers. This difficulty was ultimately surmounted by the design of this combined coal screen and breaker, which covers the entire length of hoppers placed over the retorts in the form shown.

The coal, as before mentioned, is run alongside the hoppers and tipped direct on to the screen. The greater portion of it falls through the screen into the hopper beneath, leaving the largest lumps only on top of the screen. A slight application of a hammer used by the coal wheeler is then sufficient to break the largest lumps of coal. The breaking is greatly assisted by the points of the screen forming the four sides of the mesh; and this, in fact, is one of the chief points of interest in the screen. When seen in operation, three tip-waggons only were in use—one being filled with coal, one on the lift, and the third being emptied into the hoppers. Another item of interest we observed in connection with this plant at Lea Bridge, was the entire absence of the noise and rattle of machinery in the retort-house.

The objects the inventor had in view were first to minimize the risk of breakdown and consequent stoppage in the operation of elevating the coal; and, secondly, to minimize the crushing of the coal to a fine powder, so common with many types of mechanical coal-breakers. This he claims to have accomplished; for the whole plant has been worked for the last nine months without a single hitch and without the expenditure of a single penny, except for oil and tallow, while to anyone viewing the apparatus it will be at once apparent that, owing to the absence of working parts, the wear and tear for some years to come must be infinitesimal. Mr. Cross also claims a benefit from the non-powdery nature of the coal, by the comparative freedom from "slipping" in the retort.

PACIFIC COAST GAS ASSOCIATION.

Annual Meeting at San Francisco.

The Ninth Annual Meeting was held at the Offices of the San Francisco Gas and Electric Company on the 16th to the 18th of July. The President for the current year, Mr. John A. Britton, of Oakland, Cal., occupied the chair. There was a good attendance. Thirteen gentlemen were elected as members; and the report of the Council, which was accepted by the meeting, contained a clause to the effect that future banquets or outings should be paid for by subscription of members attending the same. Mr. E. C. Jones presented a handsome bookcase, and Mr. J. P. Lowe offered a donation of £10 for the purchase of books to form a library; and a Committee was appointed to deal with the matter.

The President then delivered his Inaugural Address. Among the events of importance during the past year he instanced the International Congress of Gas Industries at Paris, the large development of the gas-engine for motive power, and the acceptance by the profession of the possibility of distributing gas under high pressures. These three items alone enabled a claim to be advanced of greater progress than in any previous year. He also referred with satisfaction to the increasing tendency to combine gas and electric interests in the district; and observed that the use of gas had increased to a greater extent during the last decade than in any three preceding ones. He was looking forward to the time when Gas Associations would resolve themselves into advisory boards, when papers would be beaten into advice, and discussion into action, and suggested that there should be constituted in the Association an advisory board, to whom members could apply for advice concerning proper modes of operating. Managers of small plants were expected to know everything about gas and

electricity, and to do all that in a larger works would be attended to by a staff of several officials. The Association should be put in a position to supply freely and voluntarily every member with such advice as he may require; and Associations of this character would not be a full success unless members could command that talent. The gas engineering profession had not received the attention it deserved in the academic world, and there was no college or institute that had the power to confer the degree of gas engineer. As a result, it was freely appropriated, and sometimes by unqualified persons. He suggested that this, as well as other, Gas Associations should take action to see that it should only be held by competent persons. In referring to municipal ownership, he deprecated the practice of watering or creating fictitious capital. No company had a right to distribute dividends upon a capital representing two or three times the legitimate value of the property; and the public could not be expected to approve such courses. Reference was next made to the large discoveries of oil in the southern part of the territory covered by the Association, and its effect on the gas industry. Already some companies were undertaking the making of their own distillates, and relying on the sale of the heavy crudes for a revenue far in excess of that usual with ordinary coal gas residuals. Water-power transmission on a large scale had done more than anything else in the way of attracting the attention of financiers to their State, and had made practicable the development of industries that otherwise would lie dormant for lack of proper fuel. Returning to the affairs of the Association, the President advocated the establishment of a central office, in a convenient locality, for the use of the members. Another need in the district was a simple and convenient standard system for keeping accounts, and the matter should be taken up by the Association.

A paper on the "Promotion of Domestic Fuel Gas Consumption" was read by Mr. R. P. Valentine, of Sacramento, Cal. He advocated extensive and continuous advertising, sufficient to develop public interest and lead to conversation, in the street cars, in the streets, and in all social gatherings, about gas and its appliances. Advertise in newspapers and all kinds of circulating printed matter, at fairs, exhibitions, and demonstrations, and then follow up by energetic personal canvassing. One of his methods was to look up all non-consumers in a street or district, prepare the way with special pamphlets, and follow up with a pleasant and gentlemanly canvasser. No opportunity of advantageously displaying a gas-stove should be lost. Then he took care to respond quickly to all complaints or grievances; for what was a better advertisement than a good reputation. He furnished only the very best class of goods obtainable. In his experience the system of supplying stoves on rental or hire-purchase terms was fraught with difficulties and dangers. A large floating capital was developed, bad customers were encountered, and a heavy stock of used and almost worthless stoves accumulated. Giving away, or supplying on advanced gas-credit terms, certainly increased the output without much trouble; but he maintained it was a lazy man's method, unnecessary where proper spirit and determination was applied. He tried it for a short time, but was glad to abolish it. He had now adopted the plan of selling at cost price, whether for stoves or labour—thus avoiding all drain of any kind on the finances; and on these lines he had succeeded in building up a good business for cookers, water-heaters, and warming stoves. His advice was "Be honest with yourself, and keep everlastingly at it."

Discussion being invited, Mr. E. C. Jones spoke very strongly in favour of systematic and persistent canvassing, and quoted figures to show that in San Francisco, with gas at 5s. 10d. per 1000 cubic feet, it was cheaper to cook and light a small house with gas than to use coal and oil. According to a test he had taken, the average of over 300 meters supplying cookers only was about 20,000 cubic feet per annum. Mr. Quilty said his experience agreed with that of the author. After trying rental, hire-purchase, &c., he had adopted the policy of selling at actual cost; and at San Jose, a town of 25,000 inhabitants, he had 1500 stoves out of which nearly half had been fixed within the last twelve months. His consumption was increasing rapidly; and he believed that 45 per cent. of the gas was used in cookers. Mr. Lowe remarked that, after trying giving away stoves on a large scale, he found that the only way was for the consumer to have an interest in the stove. The party who hired or received a stove gratis did not keep it clean; but the one who paid for it took care of it. Years of experience had convinced him that the proper course was to sell, if necessary, at cost. He believed, however, that it was usually practicable to make a little profit on the transaction. If consumers preferred to pay by instalments, he had no objection. There was a disposition to decry the hot-plate, which he could not understand, as it was cheap, took little room, and was really an aid in the introduction of gas appliances. Mr. Osborn spoke strongly in favour of canvassing, and also did not despise the hot-plate. Get a stove in if possible; and if not a nursery boiling burner was better than nothing. The President remarked that at Oakland there was a differential rate and separate meters for gas used as fuel; and he found that a cooking-stove averaged 23,000 cubic feet per annum. Mr. T. R. Parker said that at Napa he had used slot meters in connection with cookers, and the results were satisfactory. People who grumbled at a 10s. bill put £2 or more into the slot, and did not complain. He also found that a rebate for prompt payment was a good idea. Mr. M'Donald said that there were 60,000 to 70,000 slot meters in use in New York. The buildings were steam-heated; and the owners found that they must put in slot meters and gas-cookers to secure tenants. He believed the Consolidated Gas Company of New York were selling 500 million cubic feet per annum through slot meters; and the average per meter was 14,000 cubic feet per annum. The cost of repairs and maintenance was no more in the case of the slot than with the ordinary meter. Mr. Grimwood, referring to the question of natural gas as compared with artificial, said that a sample from the neighbourhood of Stockton showed a specific gravity of ·560, and contained 92·3 per cent. of marsh gas; the remainder being chiefly nitrogen. Its calculated heating value was 890 units; and it contained no sulphur. Mr. Jones said that most of the Californian natural gases were poorer than those of Pennsylvania, and did not average 700 units.

Mr. Valentine, replying to the discussion, said that at Sacramento about 80 per cent. of the gas supply was used for fuel. He furnished a mixed gas—part natural and part artificial—for 7s. per 1,000 cubic feet, and found it competed well with straight natural gas at 4s. 2d. His artificial gas was carburetted water gas, not coal gas; and he found it necessary to add the natural gas at the relief holder. If turned into the distributing holder it did not mix thoroughly. As long as he kept within 40 per cent. of natural gas, there was no difficulty. The illuminating power of the mixture was about 16 candles.

Mr. J. B. Grimwood, of San Francisco, presented a report on the International Congress of the Gas Industry, held at Paris in September last, which he attended as the official representative of the Association, giving full details of his visit, and of the proceedings. Of the numerous subjects discussed, he regarded the following as of chief importance to the members of the Association: High-pressure distribution, coal-handling machinery, inclined retorts, incandescent burners. Gas-engines and the sale of gas did not receive much attention, notwithstanding the fact that both are used in Europe to a much greater extent than on the Pacific coast. Paris was said to be the best lighted city in the world; but he thought that Berlin and Vienna were not far behind. High-pressure incandescent lighting was used to a considerable extent; and he would like to see the system tried in their district. Outside of the British Isles, there were few gas cooking-stoves sold in Europe; the so-called hot-plate monopolizing the Continental markets. But, on the other hand, gas warming-stoves were now largely used on the Continent. Considerable attention was devoted to the gas supply of Glasgow; and the author quoted at length from a pamphlet report by Mr. Foulis having reference to the proposed new works at Provan. In connection with the London supply, the author remarked that at Beckton the works were fenced in, and a large barracks provided where soldiers could be quartered in times of labour troubles.

In the course of a discussion that followed the reading of the paper, the President remarked that he was now running two high-pressure lines, one 7½ miles in length, with an initial pressure of 3½ lbs. per square inch, and having services taken off at intervals—a governor being used on each service. The other line was 8 miles long, with an initial pressure of 3 lbs. He also had smaller lines, in one case delivering up to 5000 cubic feet per hour through four miles of 3-inch pipe. In his judgment, the days of large trunk mains had gone by. He used chiefly cast-iron pipes, but also some of wrought iron; and the percentage of unaccounted-for gas had not increased. There was no trouble with the pressure regulators, or any loss of candle power.

Mr. P. M. Gregory, of San Jose, Cal., the Editor of the "Experience Department," presented his report. The first item consisted of an account of a coal-shed built of timber 120 feet long, 42 feet wide, and 20 feet high. The sides were originally supported by uprights of 2 inch by 14 inch Oregon pine; but these were not strong enough, and bulged when the shed was full. They were therefore doubled, and made to lean inwards, one foot in four, to relieve the weight. Another item dealt with the viscosity of Californian petroleums, which was sometimes so great that it was difficult to get the petroleum out of the railway tank. The author recommended drawing off a few inches from the top, and replacing with a lighter grade of oil, so enabling the tank to be emptied quicker and easier than by the application of steam. The next item recommended that, in passing petroleum through a steam-heater, the usual practice should be reversed, and the steam allowed to pass through the coil while the oil flowed through the outer casing. When the oil was allowed to flow through the coil, there was trouble from stoppages at the inlet end. Two items dealt with the using of crude petroleum as a fuel under the retort-benches, by a method very similar to that adopted for using tar. The President contributed a note on the use of a proportional meter instead of a station meter, which elicited a lively discussion. There was a general agreement to the effect that the proportional meter was not always accurate or reliable, and that it was only applicable as better than nothing, where the expense of a proper meter was prohibitive. The proportional meter described only measured 1 cubic foot in 200.

Mr. G. H. Hollidge, of Merced, Cal., the Editor of the "Wrinkle Department," next presented his budget. This included a sketchy description of the apparatus used for burning crude oil under the retorts above alluded to, and which was very similar to the devices adopted for burning tar under similar circumstances. The material used was Bakersfield crude oil, of 14° to 16° gravity, costing a little over 1d. per gallon. The consumption for a bed of fours was 70 gallons per 24 hours, representing 6s. per day, or less than half the cost of coke. The apparatus consists of a

steam-injector, supplied with steam at 80 lbs. pressure; and the oil is delivered under 40 lbs. pressure. The author also used a similar injector for forcing oil into a coal-gas retort for enriching purposes; or he sometimes saturated shavings with oil, put them in sacks, and so introduced them into the retorts. Several other items were also included; but they were of local character.

(To be concluded.)

MANCHESTER JUNIOR GAS ASSOCIATION.

The Monthly Meeting of the above Society, which was held on Saturday, the 14th inst., took the form of a visit to the works of the Radcliffe and Pilkington Gas Company, on the invitation of the Treasurer (Mr. Robert B. Braddock). The party was met at Radcliffe Station by Mr. Braddock; and on their arrival at the offices of the Company, he offered them a hearty welcome to the works. The members then proceeded to make a tour of inspection, and were much interested in what they saw.

From particulars supplied, it appears the Radcliffe and Pilkington Gas Company was established in 1846; and its area of operations extends over Radcliffe, Whitefield, Unsworth, Little Lever, and Prestwich. The make of gas is 130 million cubic feet; the number of consumers being 6385, of prepayment meters 1832, and of public lamps 1283. There are 43 miles of mains. The works include one bench of inclined retorts, 73 ft. 4½ in. long, by 17 ft. wide, consisting of six arches 9 ft. 6 in. wide, with 1 ft. 10½ in. division-walls, and 3 ft. 6 in. end piers. There are eight retorts in each arch, 24 in. by 15 in., tapering to 20 in. by 15 in., by 20 ft. long, set at an angle of 32°. The make per mouthpiece is about 7900 cubic feet. The storage capacity of the overhead hoppers is 80 tons, or 24 hours' supply to the entire stack. The coal breaker and elevator are in duplicate, and, with the conveyor, are driven by a 12-horse power gas-engine, and are capable of dealing with 20 tons per hour. There is a stack of horizontal retorts consisting of seven arches for seven through retorts, 18 in. by 14 in., and 18 feet long. There are two boilers, 20 ft. by 5 ft. 6 in., with fan blast. Condensers and tower scrubbers are supplied in duplicate. There are two exhausters of rotary type, with capacities of 30,000 and 42,000 cubic feet per hour. The "Standard" washer has a capacity of 750,000 cubic feet per day. The four purifiers are each 21 ft. by 15 ft. Each of the two station meters has a capacity of 25,000 cubic feet per hour. A new valve-house is in course of construction. There are two gasholders—one 120 feet in diameter, with two 24-feet lifts, having a capacity of 500,000 cubic feet; and the other 76½ feet in diameter, with two 20-feet lifts, and a capacity of 170,000 cubic feet. Attention was drawn to a new tank, of the brick and puddle form of construction. This is 142 feet in diameter and 30 feet deep. A twelve-month was occupied in building it. A new holder is in course of construction. This is 138 feet in diameter and 30 feet deep. It will have a working capacity of 440,000 cubic feet, and is arranged to take an additional lift later on, by which its capacity will be more than doubled. The sulphate works have a producing capacity of 2 tons per day. A hydraulic coke hoist is a useful appendage to the works. The governors have each a capacity of 65,000 cubic feet per hour; and the size of the two leading mains is 24 inches.

After the inspection, the members adjourned to the office for tea; and a short meeting was afterwards held, at which Mr. R. Garlick, in the absence of the President (Mr. C. Berry), occupied the chair. The Chairman proposed that a hearty vote of thanks should be accorded to Mr. James Braddock, the Manager and Secretary of the Gas Company, and to Mr. R. B. Braddock, his Assistant, for their kind invitation to the members to visit the works, and the cordial manner in which they had been received and entertained. The condition of the works, he added, reflected great credit on the management. Mr. Halliwell, of Littleborough, seconded the motion, which was unanimously adopted.

The annual meeting of the Association, for the election of officers, &c., will be held on Oct. 19.

OXIDATION OF NITROGEN AS A SOURCE OF ERROR IN THE ESTIMATION OF HYDROGEN AND METHANE.

The following article, by Mr. Alfred H. White, appeared in a recent issue of the "Journal of the American Chemical Society."

The author had occasion some time ago to estimate accurately a small amount of methane mixed with a large amount of hydrogen. A sample mixed with air was exploded in a Hempel pipette, with due precautions to ensure accuracy; the measurements being made in his own burette for exact gas analysis. Though great care was taken in the work, the results were so discrepant as to be entirely useless for the purpose. The results of a series of five experiments follow, arranged in the order of explosive ratios.

TABLE I.—*Explosion of Hydrogen and a Small Amount of Methane.*

Gas Sample.	Air.	After Explosion. Contraction.	After Explosion. CO_2.	Hydrogen.	Methane.	Explosive.
C.c.	C.c.	C.c.	C.c.	Per Cent.	Per Cent.	Ratio.
12·87	103·24	16·97	0·05	87·64	0·39	5·77
13·79	86·89	18·39	0·04	88·51	0·29	5·08
13·17	84·18	17·56	0·06	88·27	0·45	4·54
14·77	87·23	19·66	0·09	87·92	0·62	4·20
18·38	87·03	24·48	0·16	87·62	0·87	3·30

The increasing amounts of carbon dioxide cannot be laid to diffusion through the potassium hydroxide used, for the pipette carried enough mercury in the bottom to form a trap, nor to solution of gas by the potassium hydroxide (for the pipette had been carefully saturated by a blank experiment), nor to leak in the connections, because in each case, after removing the carbon dioxide by potassium hydroxide, and reading the volume, the gas was passed back into the same potassium hydroxide pipette, allowed to stand and again drawn back into the burette and the volume read. In only one case—the third given—did the variation in volume after such second treatment with potassium hydroxide amount to as much as 0·02 c.c. In two other cases, the variation was 0·01 c.c., and in the other two there was no change in volume. Leaving out of account the first of the series, where it is probable the great dilution caused incomplete combustion, the other four results show increasing methane and decreasing hydrogen as the explosive ratio (ratio of the inert to the exploding gas) grows smaller. The decrease in the percentage of hydrogen results from the method of calculation; all the contraction over potassium hydroxide being considered as carbon dioxide, and calculated to methane. The increase in the apparent carbon dioxide points strongly to the formation of oxides of nitrogen. That these are formed and may cause error in explosion analyses was shown long ago by Bunsen, who experimentally determined certain limits within which there was no appreciable error. The explosive ratio for pure hydrogen, according to Bunsen, might safely vary from 3·81 to 1·55. He did not determine whether any gases absorbable in potassium hydroxide were formed in the explosion. The results above cited have, with one exception, higher explosive ratios than his highest, and yet there is apparently considerable formation of an oxide of nitrogen which is absorbed by potassium hydroxide.

Bunsen's results have been seemingly everywhere accepted without question. Hempel, in the 1900 edition of his "Gasometrische Methoden," quotes Bunsen's results with the comment that "by keeping to the Bunsen form, the worst that may happen is that the mixture is not explosive. The combustion of nitrogen will certainly be avoided." The marked disagreement of the results given by Bunsen and those of Table I. made it desirable to make a series of experiments on pure hydrogen. The hydrogen was generated by the action of potassium hydroxide on aluminium, in order to obtain it free from the small amounts of hydrocarbons usually present in gas obtained by the action of an acid on a metal. The results are given in Table II.:—

TABLE II.—*Explosion of Pure Hydrogen.*

Sample Hydrogen.	Air.	Contraction after Explosion.	Hydrogen Per Cent.	Contraction over Potassium Hydroxide.	Explosive Ratio.	Bunsen's Results Recalculated. Explosive Ratio.	Bunsen's Results Recalculated. Hydrogen Per Cent.
C.c.	C.c.						
11·35	84·80	16·90	99·26	—	4·64	3·81	99·92
12·11	85·57	18·08	99·53	—	4·37	2·90	99·56
14·19	84·27	21·27	99·92	—	3·62	2·29	99·84
16·77	85·77	25·13	99·90	0·01	3·06	1·95	100·04
16·54	82·64	24·76	99·80	0·01	3·00	1·55	100·15
18·19	83·22	27·29	100·01	0·01	2·71	1·25	100·72
21·10	83·28	31·74	100·28	—	2·29	1·04	103·14
27·04	83·86	40·80	100·59	0·11	1·73	0·37	105·06

Bunsen's results, recalculated to permit direct comparison, are appended. Bunsen held that the explosive ratio might vary from 3·81 to 1·55 without causing appreciable error, though the smaller ratio gives erroneous results according to his own figures. These figures for the explosion of pure hydrogen in Table II. do not show as great variations with change of explosive ratio as do the results in Table I. of explosion of a gas carrying a small amount of methane mixed with a large amount of hydrogen. To determine if the methane caused the difference, a series of explosions of methane and air were made. The methane was made from methyl iodide and the zinc copper couple, and both gas and air were freed from carbon dioxide before use. Table III. gives the results of this series:—

TABLE III.—*Explosion of Methane.*

Sample Methane.	Air.	Contraction after Explosion.	Carbon Dioxide.	Methane.	Hydrogen.	Explosive Ratio.	Ratio Contraction Sample.
C.c.	Cc.		C.c.	Per Cent.	Per Cent.		
7·05	92·07	13·09	6·53	92·62	0·28	4·05	1·85
8·93	104·17	16·66	8·31	93·28	0·14	3·53	1·86
9·07	98·35	17·10	8·54	94·15	0·14	3·19	1·88
10·20	98·22	19·27	9·63	94·41	0·06	2·61	1·89

In these experiments, the explosive ratios all lie within Bunsen's limits for methane of 4 to 2·7; still there is a variation of 1·6 per cent. in the apparent percentage of methane as calculated by the usual methods, and a corresponding variation in the amount of hydrogen. The precautions mentioned before were taken to prevent error from diffusion or solution in the potassium hydroxide pipette. In all these experiments, the gases had been diluted with air, and the preponderating inert gas was nitrogen. Several experiments were made with mixtures of hydrogen and methane so as to determine whether any more trustworthy results

might be obtained, using oxygen alone in excess. The oxygen gas used was 96·5 per cent. pure. The results showed that the errors when using oxygen thus were rather greater than when using air in similar quantity. In several cases, both when using oxygen and air, Griess's reagent for nitrites (napthylamine hydrochloride and sulphanilic acid) was introduced into the pipette before explosion, with the result that a deep red colour was always formed after explosion—proving the formation of nitrous acid.

The explanation of the discrepancies between the author's work and Bunsen's is probably to be sought for in the different forms of apparatus employed. Bunsen used a narrow eudiometer, in which the propagation of the explosion and liberation of heat would be slower, and the absorption of heat by the glass walls more rapid, than in the nearly spherical Hempel pipette. Hence the temperature of combustion would be less in Bunsen's work, and there would be a smaller amount of oxides of nitrogen formed. In Bunsen's eudiometer also explosion took place under diminished pressure; while in the Hempel apparatus a considerable *plus* pressure was generated in the explosion. It follows that when working with the Hempel apparatus a greater amount of inert gas than Bunsen found necessary should be present. Apparently the most nearly correct results are obtained in the case of hydrogen when the ratio of the non-explosive to the explosive gases follows Bunsen's higher figure—*i.e.*, when the explosive ratio varies from 4 to 3. In no instance will absolutely correct results be obtained, as probably in all cases of explosion under these conditions nitrogen is oxidized to some extent. In the case of methane, the higher temperature of combustion causes greater errors; and here also the higher explosive ratio given by Bunsen should be adhered to.

The method of Dennis and Hopkins, in which the gas in contact with a glowing platinum spiral burns quietly in a current of oxygen and air, allows the use of a larger sample. It is, moreover, endorsed by Hempel in the following words: "The advantage gained is that in the beginning, where the combustion might become too intense, there is always an excess of combustible gas, so that on the one hand no explosion can take place, and on the other none of the nitrogen can burn, as the combustion occurs at the beginning, with an insufficient amount of oxygen, and towards the end, when the combustion becomes complete, such high temperatures as are necessary for the combustion of nitrogen are not reached at all."

Some preliminary experiments having shown that it was by no means so certain that nitrogen might not burn under these conditions, tests were made on air with Greiss's reagent for nitrites in the pipette, when it was found that a test for nitrites quickly developed after heating the wire. Table IV. shows quantitatively the effect on the volume of air when the spiral is heated to redness. The air was freed from carbon dioxide, and the samples were as nearly as might be 80 c.c. each. While it was not possible to measure accurately the temperature of the wire, a comparison could be obtained by measuring the current heating it. A current of 4 amperes heated the wire to barely visible redness in the daylight, and 5·35 amperes raised it to a white heat. The time was in each case two minutes.

TABLE IV.—*Effect of Heating Platinum Spiral in Air.*

Sample Air.	Current. Amperes.	Contraction after Heating.	Contraction after Potassium Hydroxide.	Total Contraction.
C.c.		C.c.	C.c.	C.c.
80·90	4·00	0·01	..	0·01
82·51	4·55	0·04	0·02	0·06
80·99	4·60	0·03	0·03	0·06
81·22	4·65	0·04	0·01	0·05
81·70	4·80	0·04	0·10	0·14
81·88	5·00	0·11	0·10	0·21
83·10	5·10	0·08	0·17	0·25
80·49	5·30	0·06	0·18	0·24
80·67	5·35	0·12	0·18	0·30

It will be observed that the sum of the contraction after heating and after potassium hydroxide given in the last column increases quite regularly with increase in temperature, but that there is considerable irregularity in the ratios between the contraction after heating and the contraction after potassium hydroxide. It may be that the more or less complete condensation of the nitric acid formed, depending upon time-contact and the amount of water present, is sufficient to account for it.

TABLE V.—*Comparison of Explosion and Combustion Methods on Hydrogen.*

EXPLOSIONS WITH AIR.

Sample Hydrogen	Air.	Contraction after Explosion.	Contraction over Potassium Hydroxide.	Hydrogen. Per Cent.	Explosive Ratio.
C.c.	C.c.	C.c.	C.c.		
15·32	85·34	22·71	0·04	98·82	3·43
18·15	82·39	26·93	0·06	98·91	2·73

EXPLOSIONS WITH OXYGEN.

	Oxygen.				
14·82	93·51	22·04	0·02	99·14	3·91
16·48	82·18	24·51	0·02	99·15	3·02
20·58	80·09	30·60	0·03	99·12	2·29

COMBUSTIONS BY THE DENNIS AND HOPKINS METHOD.

Oxygen.	Air.			Oxygen in Excess.
91·29	51·65	54·55	136·72	0·04	99·84	13·72
58·48	53·39	50·14	87·43	0·10	99·66	40·89
89·31	40·77	50·21	133·57	0·07	99·70	3·73

To afford a direct comparison between the explosion and combustion method, hydrogen generated from aluminium and caustic potash was stored in a gasholder containing mercury and a little dilute caustic potash. The hydrogen was supposed to be pure; but it evidently contained a little air. The oxygen used was about 97 per cent. pure.

The results of the explosions with oxygen are slightly higher than those with air, and show very little contraction over potassium hydroxide, and remarkably little variation with change in explosive ratio. The results with the Dennis and Hopkins method are about 0·6 per cent. higher than those obtained by explosion with oxygen. The variations in the individual results by this method may easily be accounted for by the intentional variation in the proportions of nitrogen and oxygen used, and the unavoidable differences in temperature of the spiral and the time of heating.

The question naturally arises: Which of these methods is more reliable? That none of them are entirely correct is certain, for if the nitrogen of the air is oxidized to an appreciable extent by a platinum spiral heated to dull redness, oxides of nitrogen must be formed in all combustions. This has been shown by Ilosvay for flames, even when the temperature of combustion was much reduced by dilution of the gas with carbon dioxide. The same author also found a slight formation of nitrous acid in the case of air burning in an atmosphere of illuminating gas, where a reducing atmosphere would always be present.

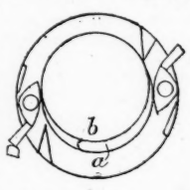
Summary.—Oxides of nitrogen are always formed in explosion analysis in amount increasing with the violence of the explosion. The dilution recommended by Bunsen, when exploding in eudiometer-tubes under reduced pressure, is not sufficient when working with the Hempel explosion pipette. If the explosive ratio is kept between 4 and 3, the error is negligible in the technical analysis of gases almost entirely hydrogen. The presence of small quantities of methane increases the error; and if large amounts are present, the error may easily amount to 1 per cent. or more. The explosive ratio should be kept between 4 and 3, as in the case of hydrogen. The method of Dennis and Hopkins tends to give high results; and the errors may easily become of importance, if care is not taken to avoid heating the spiral too much and too long. Neither the explosion method nor any other involving active combustion can give strictly accurate results.

REGISTER OF PATENTS.

Coin-Freed Gas-Meters.—Milne, J., and O'Connor, H., of Edinburgh. No. 15,974; Sept. 8, 1900.

In gas-meters in which the valve is opened by the insertion of a coin and closed by the action of the gas passing through the meter, the patentees propose to make the coin-receiver which actuates the mechanism for opening the gas-valve to consist of two discs connected together at the edges, at a small distance apart, in such a manner as to leave two openings at opposite sides sufficiently wide to allow a coin to drop through. The disc placed next the front of the meter-case has a collar or hollow trunnion on it at its centre, and the other has a stud, spindle, or trunnion carried by a standard; and on the end of the trunnion is secured a small pinion to actuate the valve-opening mechanism. A segmental spring or curved plate, secured to the upper part of the standard, presses against the face of the disc to act as a brake. Between the two discs another disc is carried, secured to the end of a spindle passing out through the hollow trunnion and through an eye on the standard to the outside of the meter-case, where it is furnished with a handle for turning, and with stops to regulate the amount of rotation.

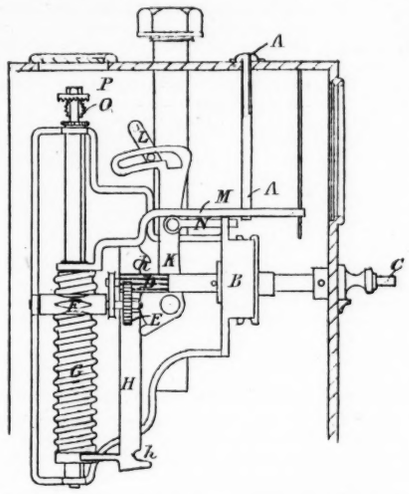
The disc has around part of its circumference a rim of irregular crescent-like shape (as at *a*), so arranged that when a coin is dropped into the receiver it will not pass completely in, but will project sufficiently to cause it to engage with the duplex disc already described, or with the arm of either of two pawls, so that when the inner disc is turned a half-turn by the handle, the duplex disc will be carried along with it, and, by means of the pinion mentioned, actuate the mechanism to open the gas-valve. One horn or point of the crescent-shaped rim is cut off so as to form a rounded end (as *b*), which, on the handle being moved backwards to its original position, presses against the edge of the coin and ejects it from the coin-receiver.



On the standard carrying the mechanism is fixed a stop, to come in contact with one or other of two pawls fitted between the two sides of the duplex disc, and on opposite sides of the coin-receiver. These pawls have each an arm kept in position by a spring or other means, so as to slightly project into the interior of the coin-receiver in such a manner as to come in contact with the edge of the coin. The other end of each of the pawls projects beyond the outer edge of the duplex disc, in such a way that when either of the coin slots or openings is in position for receiving the coin, one or other of these pawls is in contact with the stop, so preventing the coin-receiver from being further revolved until another coin is inserted and the handle again turned, whereupon the pointed end of the crescent presses against the edge of the coin, causing it at its opposite side to push against the arm of the pawl which is engaged with the stop, so as to withdraw the pawl from contact with it, and permit the disc being revolved for the remainder of one-half turn, when the other pawl will be caught by the stop.

A general view is given of one method of applying the invention to dry meters. When a coin is dropped through the slot A into the coin-carrier B, and the handle C turned half round, the pinion D, which is

fixed to the coin-carrier, actuates, through the wheel E, the special pinion F, which raises the worm G (thus acting as a rack), and carries with it the slide H, which has a recess or tooth at each end to engage with the lever K. This serves to move it to the right or left. When the slide H is at its lowest, the upper end of the lever K and the pin on the valve-lever L are to the left, and the valves are closed. When the worm G and slide H, with the pointer M, have been lifted by the insertion of a coin, the lever K is moved to a vertical position (as shown), having in its movement opened the valves by the valve-lever L being carried to the right. When the worm G has been raised by the insertion of a number of coins, until the lower recess or tooth in the slide H engages with the lever K, the latter is carried to the right, and with it the arm N. This arm then crosses the coin-carrier B, and prevents the entrance of any more coins until one "coin's-worth" of gas has passed through the meter. Then the worm G and slide H will be



lowered, the lever K returned to an upright position, and the arm N withdrawn. The passage of gas through the meter turns the usual lying-spindle of the meter with a worm thereon; and this gears through a special pinion on a cross lying-spindle, the end of which passes through a stuffing-box at the side of the meter, and is furnished with a pinion O. This pinion drives the crown change-wheel P (which may be of any desired number of teeth), and with it the spindle upon which the worm slides. The revolving of this spindle turns the worm G, which is geared with the special pinion F, and thereby is caused to move in the opposite direction to that in which it moved by the insertion of a coin, until the slide H, with its upper recess or tooth, engages with the lever K, and moves its upper end to the left, closing the valve and preventing the passage of gas until the valve is opened again by the insertion of a coin.

Incandescent Gas-Burners.—Sugg, W. T., of Westminster. No. 19,061; Oct. 24, 1900.

In burners for incandescent gas lighting, in order to prevent lighting-back, the patentee proposes to employ a taper tube connected at its larger end with an enlarged circular chamber, a disc of perforated metal placed across the chamber, a tubular extension of less diameter than, and extending from the top of, the chamber, and a steatite burner proper carried by the extension, and having rows of holes set at an angle near the outer edge of the disc—leaving a solid central portion. As shown, the arrangement of burner allows the jet of gas to be injected into the small end of a taper tube A, the larger end of which enters a circular chamber B of enlarged diameter—say, 1¾ inches. Across this chamber, at or near the largest part, is placed a disc C of perforated metal. Connected with the top of the chamber, which is again contracted, is a tubular extension of less diameter (say, about 1 inch) than the chamber, and carrying a burner proper, consisting of a steatite cap D about ¾ inch deep, with an internal diameter the same as the tubular extension—say, of about 1 inch. This steatite cap is provided with rows of holes in the top drilled at a suitable angle as near the edge of the cap as possible, and with a solid portion in the middle. The perforated disc C prevents the lighting-back; and the burner constructed as described will, says the patentee, have "the additional advantage of being a non-conductor of heat, so that the metal part of the burner will remain cool."

Combined Coal Screen and Breaker for Inclined Gas-Retorts.—Cross, F. W., of Lea Bridge. No. 22,858; Dec. 14, 1900.

This invention relates to the apparatus shown for controlling the size of coal and providing facilities for the breaking of the larger lumps of coal to a size suitable for inclined gas-retorts.

Fig. 1 is a section of the coal-screen as fixed in the coal-hopper, fig. 2 is a plan of one segment of the screen, fig. 3 is a section of fig. 2, and fig. 4 shows alternative enlarged sections of the ribs of the screen.

The controller of the size of coal for the retorts consists of a screen or screens A of metal of variable sections or shapes as necessarily arises, placed at the top of the coal-hopper B, and supported in position by bearers C at both ends. The screen (divided into segments, varying in size according to the width or length of the coal-hopper in which it is placed, and of such size as may be convenient for fixing or removal), made of cast or wrought iron or steel, is preferably of curved form, covering the top of the coal-hopper. The mesh may be 4 inches by 3 inches in size, or slightly varying from this size according to the angle at which the inclined retorts are set; and four angular points D

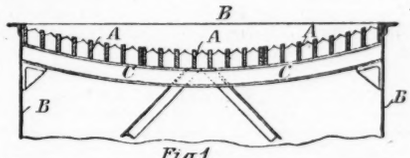


Fig. 1.

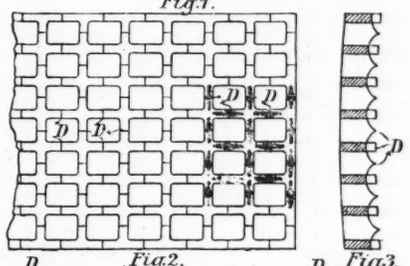


Fig. 2. Fig. 3.

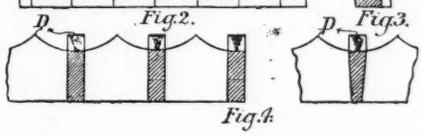


Fig. 4.

rise from the upper side of the screen on each of the sides of the mesh. The coal is elevated to the hopper floor, and deposited on the screen. With the exception of the larger lumps, it passes at once through the screen; and the larger lumps are then easily broken upon the angular points of the screen.

Incandescent Gas-Burners.—Biheller, S., of Chiswell Street, E.C. No. 2856; Feb. 9, 1901.

Three forms of this burner are shown. In all it indicates the central tube supplying gas and air in the usual manner. B is a cone "sprung" on to the central tube. The lower part of the cone is closed so that no air passes up between it and the tube A. C is a gallery which, in figs. 1 and 2, carries a piece D, of glass or other suitable material, forming an "inner cone" D, consisting of a tubular piece the upper part of which is restricted, as appears in the drawings.

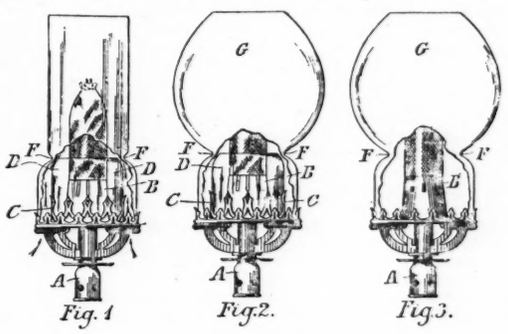


Fig. 1 Fig. 2. Fig. 3.

In fig. 1, the chimney is of the shape usually employed for petroleum lamps, with a "throat" or narrowed part at F. The lower portion of the cylinder is wider than the upper part. The current of air enters below, passes up between the lower part of the chimney and the inner cone, and it is at F deflected towards the centre, so that it forcibly strikes the flame at or near its bottom. The long upper part of the chimney produces a forced draught.

In fig. 2, the upper part of the cylinder or chimney G constitutes the "globe" or shade of the lamp. The "throat" or narrow part at F, must be in conjunction with the straight part, so as to direct the incoming air to the base of the flame.

A simpler form, illustrated in fig. 3, dispenses entirely with the inner cone D, and relies on the cone B in conjunction with the straight part of the globe or chimney, co-operating with the "throat" F, to produce the requisite deflection of the current.

Incandescent Gas-Burners.—Fischer, J., of Aldermanbury, E.C. No. 9222; May 3, 1901.

This invention relates to means for affording an increase in the illuminating power of incandescent mantles, by dispensing with the usual chimney and admitting an additional supply of air to the lower part of the flame of the bunsen burner. The patentee proposes to arrange upon the base of the burner an annular holder or gallery having openings in its sides through which air passes direct to the flame—preferably slightly lower than the level of the combustion-point.

Nernst Lamps for Street Lighting.—The Prism Globe Company Limited, are supplying to the Urban District Council of Shipley, York shire, a number of their two-light swan-neck brackets and fittings, each adapted to carry two 40-watt "Nernst" lamps. This is believed to be the first instance in England where "Nernst" lamps will be employed for public street lighting.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Mr. Herring's Engineering Congress (Gas Section) Paper.*

SIR,—I have been reading Mr. Herring's very interesting paper on inclined retorts; and I take this opportunity of expressing regret that I was prevented from personally listening to the writer.

The paper contains one or two remarkable statements; one being that a continuous hopper costs no more than a central one, and that the latter cannot be as economical to work as the former (or words to that effect). Before me, I happen to have the alternative designs of the fittings of a retort-house on either plan; and I can assure Mr. Herring that there is a vast difference in price in favour of the central hopper.

Mr. Herring likewise adds that the use of the central hopper entails more labour on the stoker. Now, from personal observation, I am induced to opine that if the gentleman who manipulates the introduction of the coals into the retorts had *less* to do, he would practically suffer from *ennui*, and the few steps (very few) he has to take to and from the central hopper to the retort mouthpieces afford quite salutary exercise, tending to reduce the *ennui* previously mentioned.

Why we should pile up overhead in the retort-house some tons of costly ironwork, to reduce the labour of this already overpaid and underworked individual, is as equally puzzling as the train of reasoning which brought into existence the continuous hopper.

F. D. MARSHALL.

Copenhagen, Sept. 16, 1901.

SIR,—As Mr. Herring is among our up-to-date carbonizers, and a thorough-going advocate of mechanical conveyors and other labour-saving appliances in retort-houses, it is with great reluctance I write you to express my dissent from one remark in the paper he read at the International Congress at Glasgow—namely, "The author prefers the cast-iron trough and roller chain type of conveyor." Experience in this as in other matters should be the unerring guide, and my experience of coke-conveyors from 1888 till 1899—during which period we supplied cast-iron troughs—led to the adoption of steel troughs, as the sudden contraction caused by the quenching water on the heated surface of the trough cracked the cast iron. The water leaked through these cracks, and did serious damage to the fronts of the furnaces and settings.

Two years ago, one of the large steel companies put down a mill to roll a special splayed steel-trough for my patent hot-coke conveyor. We, therefore, abandoned the cast-iron for the reason stated above, and the improved rolled-steel trough has entirely obviated the "cracking" and other troubles we experienced in our earlier types.

Hot-coke conveyors exactly of the design Mr. Herring states he prefers, with the improvement of the rolled-steel trough, have been installed at Brighton and other gas-works.

GILBERT LITTLE.

Sept. 6, 1901.

SIR,—I fancy Mr. Herring has not had experience with hot-coke conveyors of any design, and is speaking somewhat "off-hand" when he indicates his preference for cast-iron troughs. Conveyors in cast-iron troughs were not a success in this district; while the design of steel is entirely satisfactory, either as a coke carrier in gas-works, an ash carrier from batteries of boilers at electric-light works, and also as a clinker carrier from rows of gas-producers.

R. A. WHYTE.

Sept. 3, 1901.

The Proposed Gasholder for Amsterdam.

SIR,—I am rather surprised to find from the tone of the somewhat meagre discussion on Dr. van Rossum du Chattel's paper read before the Glasgow International Engineering Congress, as reported in your last issue, that the design of gasholder tank described in the paper is apparently looked upon as something quite new.

The principle of forming a store room, or otherwise using the space, underneath a gasholder tank is "as old as the hills." It is an English invention. Some 40 years ago, Mr. Frederick Gye obtained a patent (No. 2075; dated Aug. 20, 1861) for this. In "The Builder," April 12, 1862, an interesting description of "Gye's Gasometers and Tanks" appeared. I sent a copy of this article to the "JOURNAL" in 1890, and it was reprinted Aug. 12, 1890, p. 350.

The actual erection of gasholder tanks on this principle first found favour in Germany, where the first holder of the kind was erected in 1883 to designs by Professor Otto Intze. Professor Intze presented a paper on the subject to the Gas Institute in 1885. Speaking generally, the interior of the Intz tank is either domed in shape or the combination of a dome or frustrum of a cone with a dished top. An example of the Intze type may be seen very fully illustrated in the "Zeitschrift des Vereines Deutscher Ingenieure" for Oct. 15 and 22, 1887.

In the gasholder tank now proposed to be erected at Amsterdam, the construction is somewhat different. The inner "mantle" or wall of the tank is vertical, and is mainly supported by a series of vertical stays and horizontal rafters radiating from the centre; the stays and rafters being mutually supported by diagonal struts. The weight carried by the rafters is proportioned so as to transmit (through the medium of the struts) to the vertical stay an outward thrust, to assist in resisting the inward pressure of the water on the inner wall of the tank. This is an advance on the ordinary construction of the Intze tanks. It is lighter (strength for strength), very much simpler to make and erect, and therefore cheaper, but the "invention" is certainly not new.

In 1890, a patent was granted in England to the late Mr. W. T. Walker (of the well-known firm of C. & W. Walker) for an annular gasholder tank constructed exactly on this principle. The patent is No. 4027, of March 14, 1890, and an illustration of the tank appeared in the "JOURNAL" for March 31, 1891, under "Register of Patents."

From this it will be seen at a glance that the principle of construction now under review was long since anticipated in England.

Whether or not there be any merit in these inventions, I do not think, when our friends come to us from the Continent and read these excellent papers describing them, they should be accepted as if they were new, and that no voice should be raised to point out that the ideas are old, and originated in England many years ago.

At the same time the greatest praise is due to our Continental friends for the thoroughness with which they work out all the intricate problems connected with the stresses in such structures; and the gratitude of British gas engineers is due to them for the time and trouble they go to in laying such valuable information before us.

F. S. CRIPPS.

71, *King William Street, E.C.,*
Sept. 17, 1901.

P.S.—It is a very great pity that many of the diagrams accompanying Dr. du Chattel's interesting paper have been reproduced to such a small scale that one almost requires a microscope to see them. As the paper dealt nearly exclusively with the "principles of construction," full details could scarcely be expected. But sufficient might have been given, and to a larger scale, to render the construction clearer.—F.S.C.

The Self-Enrichment of Coal Gas.

SIR,—In 1896, there appeared in the "JOURNAL" some correspondence on the "Self-Enrichment of Coal Gas," discovered by Mr. Shadbolt and myself independently. It was most interesting to read in the "JOURNAL" yesterday, in the paper by Dr. F. Schniewind, of New York, on "The Production of Illuminating Gas from Coke-Ovens," that the gas so made and supplied for illumination is independent of any other enriching materials than the vaporous illuminants—benzol, &c.—transferred from its tar-oil to the gas. This, no doubt, is the cause of the self-enrichment of coal gas from ordinary gas-retorts; and it may lead to more self-enrichment being tried and adopted.

JOHN MARTIN.

Ormskirk, Sept. 18, 1901.

Professor Lewes's New Experiment in Gas Manufacture.

SIR,—I regret that I was unable to be present in Glasgow to hear Professor Vivian B. Lewes read his instructive paper on the utilization of water gas in the distillation of coal; but I have read it with great interest and, I trust, profit to myself.

I am now writing to suggest a possible solution for the apparently unaccountable results which Professor Lewes obtained when he stopped up the ascension pipes at one end of the retorts. May not the decrease in the make of gas per ton, and the increase in the candle power, be due to this?—viz., that when working with one ascension pipe only, and, if the vacuum was the same in the foul main as when working with two ascension pipes, there would, I think, be more pressure in the retorts, and therefore less gas to go to the meter.

Again, under these conditions, there would be less chance of any furnace gases coming into the retorts, to reduce the candle power.

When working under normal conditions, and with a seal in the hydraulic main greater than the vacuum in the foul main, it is possible to get a slight "pull" in the retorts.

I hope to make some experiments, which will, I trust, prove whether the above solution is correct or not.

D. H. HELPS.

Redhill, Sept. 20, 1901.

Mr. Porter's Paper on "British Water-Gas Practice" at the Last Gas Institute Meeting.

SIR,—Shortly after the Gas Institute meeting in June, my attention was drawn to the fact that Mr. Porter in his paper, at line 46 of Statement A (see JOURNAL for June 18, p. 1655), was referring to Middlesbrough; the statement being that 87 lbs. of coke were used per 1000 cubic feet of carburetted water gas manufactured. I was present at the reading and discussion of the paper, but had no idea that the author was alluding to me when he said: "It had been pointed out that one of these undertakings used no less than 87 lbs. of coke. The gentleman who was working this plant was in the room."

On learning that the reference was to Middlesbrough, I at once investigated the matter, and found that the quantity stated (the returns being supplied by the Borough Accountant) represented the whole of the coke used on the works—*i.e.*, for coal-gas manufacture (boilers) and carburetted water-gas manufacture (boilers and generators). I found, moreover, on referring to the "Gas Undertakings (Local Authorities) Government Returns," on which Mr. Porter based his conclusions, that the 5697 tons of coke (p. 41, column 17) came under the heading of "Nature and Quantity of Other Materials Used for the Manufacture of Gas during Year ended March 25, 1900;" whereas Mr. Porter in his paper (Statement A) made it appear that that quantity of coke was for carburetted water gas alone. So that the meaning of the figures he gave, and that indicated by the heading of the column in the returns, were quite at variance.

I informed Mr. Porter of this serious error in his paper, and he replied: "I am sorry indeed if I have misrepresented your working statements in my paper on 'British Water-Gas Practice.' It never occurred to me to suppose that coke used in coal gas plant boilers would be included in water-gas returns; and I think the columns referred to intend that such should not be the case. Prior to your making water-gas returns, you did not make any special reference, in your returns, to coke used in boilers. In no other instance have I heard of the same being included. Would it not be just as reasonable to expect to find the coke used in furnaces included? However, if you will kindly let me have the amount of coke used in the boilers for coal-gas purposes, I will have the matter corrected before appearing in the 'Transactions.'"

To this I replied that Mr. Porter's idea that column 17 of the Government Returns represented water gas, was fallacious, as he had only to refer to several of the other returns to find that they disagreed with his assumption.

That to rectify the matter I should supply the necessary correction

* *Ante*, pp. 767-76.

in the coke returns, does not appear to me to deal adequately with the statement that the Middlesbrough plant was consuming "87 lbs. of coke per 1000 cubic feet of water gas manufactured;" and I have suggested to Mr. Porter that he should, in the Technical Press, acknowledge the error he had committed, so as to give as wide publicity as possible to the correction required. I have waited over two months for Mr. Porter's reply, but in vain; and as the question is one of considerable importance to those contemplating the introduction of water gas, it seemed incumbent upon me to delay no longer, but, in the interest of all concerned, to make the facts of the case public myself.

Middlesbrough, Sept. 20, 1901. DAVID TERRACE.

"Shale" writes: "A gas-main is being blown through with compressed air, to get rid of hydrocarbon; an oil-gas engine being temporarily connected to pump air. This air—of course, hot—is sent into one of the high-pressure gas reservoirs at a pressure of about 150 lbs. per square inch. Nearly all the gas has been got out of the reservoir; but the air will possibly be a mixture containing (say) 10 per cent. of oil-gas, and at the bottom of the reservoir there is a certain amount of hydrocarbon liquid. There is no perceptible leakage anywhere, and no light near. But, without warning, an explosion occurs. The mixture of gas and air is no doubt extremely explosive; but would it be possible for any compound to be formed of a much increased volume? If you can help me to a solution of this problem I shall be glad."

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, Sept. 18.

(*Before the* LORD CHIEF JUSTICE OF ENGLAND, *sitting as Vacation Judge.*)

Welsbach Incandescent Gaslight Company, Limited, v. The United Chemical Works and Julius Norden, and in the Matter of Walter King (K.B.D.) for Committal.

Same v. Standard Incandescent Gaslight Company, Limited, and Another, and in the Matter of Walter King.

Same v. King and Another.

These were motions upon behalf of the plaintiffs, for the committal for Contempt of Court of the Publisher of the "JOURNAL," and for an injunction to restrain the publication of a libel.

Mr. BOUSFIELD, K.C., upon behalf of the plaintiffs, said that, as a very handsome retractation and apology had appeared in the "JOURNAL," in addition to an agreement having been made to pay the whole of the plaintiffs' costs, it was proposed, with his Lordship's consent, not to proceed with the motions.

The LORD CHIEF JUSTICE: Very well.

Unsuccessful Proceedings against a Gas Stoker.

On Monday last week, the Brighton and Hove Gas Company sued Philip Pattenden, at the Hove Petty Sessions, for payment of £1 4s., being a week's wages in lieu of notice. Mr. Miles, the chief foreman at the gas-works, said he employed defendant as a day labourer; and when he was engaged, it was understood that a week's notice should be given on either side. Defendant submitted that he gave the under-foreman notice on the Friday. He further stated that he was a Reservist in the Army Medical Corps, and had served in South Africa. The foreman, recalled, said the under-foreman had never told him that defendant had given him notice to leave. It was quite proper for the under-foreman to receive the notices; but it was his duty to pass them on to witness. The Bench gave their decision for the defendant, and 3s. was allowed him for his attendance.

A Stoker fined for Unlawfully Leaving Work.

On Saturday week, at the Dorking (Surrey) Petty Sessions, Frederick Whitelock, a stoker, was proceeded against under the Conspiracy and Protection of Property Act, for having left the employ of the Dorking Gas Company without notice. It was alleged that on June 8 defendant applied for, and was granted, an evening off, but he did not return to work on the following evening, in consequence of which the Manager was put to much inconvenience in getting other persons to discharge the duty. The probable consequence of defendant's conduct, it was alleged, was to deprive the inhabitants of Dorking wholly, or to a great extent, of their supply of gas. One of the conditions of the employment of men at the gas-works was fourteen days' notice on either side to terminate the engagement. The Bench thought the offence a serious one, and imposed a fine of £3 and 9s. 6d. costs.

Robbing a Slot Meter.

At the Isle of Wight Petty Sessions, recently, the bearer of the name of Algernon Frederic Eustace Gladdis was charged with the contemptible offence of stealing about 10s. from a slot gas-meter, in the house where he lodged, and which meter was the property of the Cowes District Council. He first denied the charge, but afterwards admitted its truth. The Chairman gave him the option of paying a fine of £2, or being imprisoned for 28 days.

The Stone for the Derwent Valley Water-Works.—It is understood that the Derwent Valley Water Board have definitely decided to draw the stone supply required in connection with the construction of their works from quarries in the neighbourhood Grindleford.

MISCELLANEOUS NEWS.

GLASGOW GAS AND ELECTRICITY SUPPLY.

Annual Reports and Accounts.

The reports of the Gas and Electricity Committees of the Glasgow Corporation, along with the accounts for the year ending May 31, have just been issued.

The Gas Committee report that the gross revenue amounted to £869,942, and expenditure to £811,117, to which is added depreciation written off capital £31,306, making together £842,423; the balance carried to profit and loss account being £27,518. The Committee had to meet the following requirements during the year: (1) Annuities on stock, £34,762; (2) interest on borrowed money and redeemed loans, £39,478; and (3) sinking fund, £8281, together £82,521. Deducting from this the sum of £27,518, there remains a deficiency on the year's operations of £55,003. From this the balance brought from last year's account, amounting to £584, fell to be deducted, leaving a balance to be carried forward to the debit of next year's account of £54,419. The Committee regret that the price for residuals has fallen very much during the year, which has resulted in a serious reduction in income from this source, amounting to £27,420; the average price received per ton of coal carbonized being 2s. 8·46d., as compared with 3s. 5·62d. for the previous year. The quantity of coke sold during last year was 219,100 tons, as compared with 259,679 tons for the previous year; the average price received being 8s. 10·55d. per ton, as compared with 6s. 0·93d. for the previous year. The Committee, as usual, advertised for tenders for coal to be supplied during the coming year, and have concluded contracts for almost the whole quantity required at a considerable decrease per ton under last year's prices. Having regard to the large deficit on the year's operations, and to the capital expenditure, which will be still further increased during the current year in the erection and equipment of the new gas-works at Provan, which will necessitate a larger sum being provided for in respect of interest and sinking fund, and that that expenditure will be non-productive for a considerable time, the Committee recommend that the price of gas be continued at the present rate—namely, 2s. 6d. per 1000 cubic feet. The quantity of gas made during the past year was 6,121,367,500 cubic feet, and the quantity sold or accounted for 5,475,124,000 cubic feet; the quantity unaccounted for being 646,243,500 cubic feet, or 10·55 per cent. The sinking fund, with its accumulations, now stands at £410,706. The borrowing powers of the Corporation under the Gas Acts, both for gas and electricity purposes, were exhausted as at May 31 last; but by the Glasgow Corporation (Tramways and General) Order of 1901, power is conferred upon the Corporation, acting under the Gas Acts, 1869 to 1899, to borrow £1,200,000, in addition to the £2,000,000 already authorized to be borrowed under these Acts. Of this additional £1,200,000, the sum of £500,000 is to be applicable for the purposes of the electricity undertaking, thus leaving £700,000 available for the gas-works. By this Order, the Corporation are required, from and after June 1, 1902, annually to set apart, out of revenue, a sinking fund of not less that 2½ per cent. on the amount borrowed by them under the powers of the Order as at May 31 in each year, and not paid off by other means than the sinking fund. In addition to the sinking fund required to be set apart by section 83 of the Act of 1869, the Corporation, acting under the Gas Acts, are further bound under the Order, from and after June 1, 1905, annually to set apart as a sinking fund not less than 1½ per cent. on the sum of £1,000,000, being the amount of the present estimated capitalized value of the Corporation gas annuities so far as not redeemed; and this new sinking fund may be applied either to the redemption of these annuities or to repayment of the moneys borrowed by the Corporation under the Gas Acts. Considerable progress has been made with the construction of the new works at Provan. The tar-distilling works at Dawsholm are being pushed forward with all possible speed; and it is hoped that they will be so far completed before the coming winter season that a portion, at least, may then be ready for use. About 23 miles of new mains have been laid during the past year. The number of meters in use on May 31 was 206,564; being an increase of 4686 over the number in use at the same date last year. During the year 18,980 meters were repaired, and 25,700 were examined while in use, of which 22,954 were found in a satisfactory condition, and 2746 defective. The number of gas-stoves lent out on hire as at May 31 was 21,053; and there were 1384 gas heating and cooking appliances sold during the year. By section 21 of the Glasgow Corporation (Tramways and General) Order, 1901, before referred to, permissive power has been granted to the Corporation, at any time they think proper to reduce the illuminating power of the gas supply from 20 to 16 candles.

The accounts of the Gas Committee show the stock capital to be £415,000, unchanged from the previous year, and the loan capital to amount to £2,000,000. The total amount borrowed was £1,685,698—an increase during the year of £290,698; and the total amounts repaid £314,301, of which £15,866 was repaid during the year. The capital expenditure during the year was: Dawsholm station and works, £6917; Tradeston, £2081; Temple, £7621; Provan, £77,657; chemical works at Dawsholm, £2580; chemical works at Tradeston, £1010; pipes and cost of laying, £21,064; meters, £11,558; and gas-stoves, £8061. In a detailed statement as to capital outlay, it is shown that the total expenditure upon meters has been £418,930, on account of which there has been written off for depreciation £237,384 (£10,850 last year), leaving the capital value of meters in the books of the department at £181,546. The total outlay upon gas-stoves has been £79,663. There has been written off for depreciation, or received for stoves sold, £36,144, leaving the capital value of gas-stoves at £43,519. The total capital account is stated at £1,530,000. The revenue account shows that the total income of £869,942 exceeded that of the previous year by £99,940. The sum realized from sales of gas was £673,346—an increase of £95,412. (The price of gas was increased by 4d. per 1000 cubic feet.) Coke realized £92,602, or a decrease of £23,895; ammoniacal liquor and tar, £93,926, or a decrease of £27,420; and there was received for stove hires £5798, an increase of £727. Of the total expenditure of £811,117, manufacture of gas cost £709,450, or an increase of £153,121.

There was carbonized 678,200 tons of coal, an increase of 11,431 tons. The average price per ton was 15s. 6d., or 4s. 1d. per ton more. The total cost of coal was £527,447, or an increase of £145,049. Purifying materials cost £32,361, or £1909 more; salaries amounted to £4360, or £45 less; wages were £85,932, or £2366 more; and repairs and maintenance cost £51,700, or £2373 more. Distribution of gas cost £60,908, or an increase of £4769. Rents, rates, and taxes amounted to £24,893, management to £9865, law charges to £421, parliamentary charges to £160, and retiring allowances to old servants of the Gas Companies to £335. Depreciation is stated at £31,306, or a decrease of £14,323 upon the amount in the previous year.

The Electricity Committee state that the gross revenue for the twelve months ending May 31 last amounted to £79,449, and the working expenditure to £46,647. There was thus a balance of £32,802 with which to meet interest and sinking fund payments amounting to £33,210. A deficit on the year's ordinary working of £408 was thus shown; but to this had to be added the proportion charged to this year's revenue account of the cost of lamps and fittings supplied to consumers consequent on the change of voltage, £4109, making a deficit for the year of £4517. To meet this, the amount of £4517 standing at the credit of the reserve fund has been taken. The Committee regret that the result of the year's operations has not been more favourable, which is due to the increased interest and sinking fund charges on the large amount borrowed for the new works and mains, which are not yet wholly productive, and also to the special charge on account of lamps and fittings. The quantity of electricity sold to private consumers in the past year was 6,290,819 units, as compared with 3,788,795 units during the previous year; being an increase of 66·04 per cent. The number of consumers was 4031, as compared with 2852 in the previous year.

The accounts show that the Committee have borrowed £857,633, and have repaid £27,366. The capital expenditure during the year was £226,661, of which £132,199 was expended upon mains and cables, £50,789 upon the Pollokshaws Road station, and £25,006 upon the Port-Dundas station. The revenue account shows that £74,524 was derived from the sale of current per meter and £4925 from public lighting. The generation of electricity cost £30,843, of which £19,667 was required for coal and £6331 for wages at generating stations. Distribution of electricity cost £5017, of which £3327 was required for the repair and maintenance of mains and cables. Attending and repairing public lamps cost £1542. Rents, rates, and taxes amounted to £5080. Management cost £4163. There has been nothing written off for depreciation of works, machinery, or mains.

The reports and accounts were considered at a meeting of the Corporation on Friday, presided over by Lord Provost Dr. Samuel Chisholm.

Mr. R. M. Mitchell, the Convener, moved the approval of the report and accounts of the Gas Committee. He regretted to say that, for the fifth time during the 32 years of the Corporation ownership of the gas-works, the balance-sheet showed a deficit on the year's working. On the other hand, he was glad to state that the deficiency had arisen, not from any unsoundness of the business, or from any neglect on the part of the Committee or officials, but simply, as on former occasions, from the exceptionally high price of coal, which entered so largely into the final results. It would be in the recollection of the Council that this time last year the Committee were well aware that a considerable increase in the price of gas would be necessary, but that they thought the deficiency might be spread over two years, and therefore fixed the price at 2s. 6d. per 1000 cubic feet. The result of the year's working, in which a moderate depreciation had been included, and provision made for sinking fund and interest on capital expenditure, showed a loss of £54,418. This necessitated the Committee recommending that the present price be continued for another year. As would be seen from the report, coal contracts had been entered into for nearly the whole quantity required, at a reduction in price of about 3s. 5d. per ton as compared with the previous year. About 100,000 tons of third-class coal had still to be bought, which would be obtained at a greater reduction. The former purchases included the requirements of first-class cannel—which was still at a very high price—thus making the average reduction less than it otherwise would have been. Sanction had been obtained to reduce the illuminating power of the gas from 20 to 16 candles—a change which would enable the Committee to use almost entirely a lower class of coal. While provision had been made for another year for the present standard of 20 candles, the Committee would respectfully suggest that the Corporation consider seriously the desirability of in the near future exercising this power, as they were advised that a lower standard would, besides being cheaper, be (1) equally satisfactory to private consumers of ordinary or incandescent lights; (2) equally efficient, if not indeed superior, for public incandescent lighting, which had been so successfully illustrated in the illumination of the Exhibition grounds; and, what was quite as important, (3) equally suitable and more economical for motive power purposes. Notwithstanding the increase in the consumption of electricity, the amount of gas made last year increased by 2·53 per cent., which the Committee considered satisfactory; and while wishing the prosperity of all the Corporation undertakings, the Gas Committee considered it would be their first duty to safeguard the prosperity of their department, and give the citizens the best value possible in the future, as they had endeavoured to do in the past. The new works at Provan were making excellent progress, as well as the extensions to the chemical works at Dawsholm, which latter for many years had been urgently required. A section of the Engineering Congress lately visited the Provan Gas-Works; and Mr. George Livesey, the Chairman of the Gas Section, expressed admiration of the undertaking, and of the design and completeness of the plans for the new works. The Committee desired to express their satisfaction with the work of the department during the past year, and to endorse the high compliments paid to their Engineer by his professional brothers, who honoured them by visiting the works. While looking forward to a period of possible depression in trade, which could not help adversely affecting the sale of residual products, and specially coke (of which they sold upwards of 260,000 tons annually), the Committee still cherished the hope that next year's statement would be much more satisfactory; and they assured the Council that every effort would be put forth to achieve this end.

Mr. W. Fife, the Sub-Convener of the Committee, seconded. He said he believed that, by keeping the price of gas as at present, they would be able, during this year, to wipe off, even with a less price for coke and residual products, the adverse balance of nearly £55,000; and that they would have a small amount to the good at the beginning of another year.

Bailie Murray asked why details were given of capital accounts, some of which had been closed for twenty years. He did not think it was necessary to give these items.

Bailie D. M. Stevenson thought the accounts were improved in the matter of giving details which were not formerly furnished. He thought it was desirable to give details which showed what expenditure had been made, and how it had been dealt with. But, in his opinion, the accounts could be still further improved. He found that the gas-works were entered as of the capital value of £1,500,000; whereas they were worth a great deal more. He thought that the Gas Committee had written off for depreciation ridiculously—quite the opposite to the Electricity Committee. The accounts should be made to show that the Corporation were in possession of surplus assets to the extent of at least a million of money.

The motion was agreed to unanimously.

Bailie Maclay, the Convener of the Electricity Committee, moved the adoption of the accounts of his Committee. He said it would be seen that, after discharging all their ordinary obligations—after providing interest on capital expenditure and sinking funds—their accounts were just about square. In a word, there was nothing left for depreciation. The Committee were of opinion that, taking into account the fact that last year was an exceptional one, that every article of consumption was advanced in price, and that they continued the price of current at the old figure, they should be allowed to write off nothing for depreciation. In other days, when they had a surplus, they wrote off for depreciation very liberally—so liberally, in fact, that if they spread the sum allowed for depreciation over the years since first they began business, it would be found to amount to something like 4 per cent. per annum, in round figures. So that in other years they did well for depreciation, and they asked this year to be allowed to pass. He maintained that merely to make a book-keeping entry for depreciation was to some extent a sham; and that unless the amount of depreciation were taken out of the current year's revenue, it was no depreciation at all. Therefore they came before them frankly and honestly, and told them how they stood. He was happy to be able to say that during the year their revenue from the sale of current increased by about 66 per cent. The consumers increased by 41 per cent.; and the number of motors connected at the end of the financial year was considerably more than double those connected at the beginning of the year. They had a much increased demand for electricity; and he thought they had now turned the corner. They had an excellent undertaking, which only required a little time to develop. In their desire to meet the wants of the public, they had been gradually reducing the price of current. He found that if they had continued at the price charged four or five years ago, and had been able to obtain a demand as large as they now had, they should have saved the consumers something like £162,000. Had it not been for the rise in the price of coal, they would have had a sum about equal to the depreciation. Taking all the circumstances into account, they had done better than they expected.

Bailie Finlay, the Convener of the Finance Committee, in seconding, said he thought they were developing their business in a most remarkable way. He anticipated that next year their revenue would be such as would enable them to fall back upon the old system of writing off a sufficient sum for depreciation. The day-load—an important matter—had more than doubled itself during the year; and they were trying to give consumers of electricity for power purposes an advantage in that respect. He quite agreed that in some respects their accounts were not what they should be; but there was no deception in them—everything was correctly stated. He hoped the Council would recognize the great difficulty the Committee had. They had a capital account of £850,000; and it required an enormous amount of revenue to pay interest and to provide sinking fund and depreciation upon that. If they looked back for nine years—the time they had been in the business—they would find they had written off £74,000. This was about 3·81 per cent. in the consecutive years; and he thought it compared favourably with any other electricity undertaking.

Bailie D. M. Stevenson proposed an amendment, which he had unsuccessfully moved in Committee, that the accounts be sent back to the Committee to report what depreciation should normally be written off, and that the Treasurer be instructed to state the amount of the non-productive capital expenditure. He pointed out that depreciation had been written off more or less in a haphazard way. The accounts should be stated in such a manner that they could understand them without requiring some person to explain.

Mr. C. Webster thought that, unless the Committee took up the question of depreciation seriously, they would find themselves in a very awkward position. If they had written off in the same way as they did in 1897, there would have been a deficit of about £50,000.

Bailie Willock, in support of the motion, said the Committee were handicapped by the large quantity of unproductive cables they had lying in the streets. They had good reason to know that in the coming year they would double their output; and as their outlay would not be proportionately increased, they would be able to provide for depreciation as freely as they had done before.

Bailie Murray said he was very sorry that he must agree with those who asked that the accounts should be sent back. The argument of the Convener was simply that if they had the revenue they would have written off depreciation, but that, because they had no revenue, they would not write off. The Gas Committee brought out a deficiency of something like £55,000; but this did not prevent them providing for the depreciation of their plant. The Committee regretted that the results had not been more favourable, and said this was due to the increased interest and sinking fund charges on the large amounts borrowed for new works and mains. Was that true? He was prepared to prove that it was not. As a matter of fact, they were paying a smaller rate of interest; and the sinking fund, instead of bearing a larger proportion to unproductive capital than it did, bore a smaller

one. Last year interest and sinking fund charges showed an increase of 54 per cent.; but the electricity sold showed an increase of 65 per cent. He considered that the accounts were so serious—in fact, so alarming—that the Committee should take them back.

Mr. BILSLAND thought it was forgotten by some of the speakers that the Electricity Department was only in process of development.

Mr. P. G. STEWART, supporting the amendment, said they must depreciate, whether they had income or not, if they were to have their business in a sound financial position.

Mr. BURT asked if what was proposed by the Committee was the system which had dominated the other departments of the Corporation. He pointed out that, as they had reduced the charges for electricity, the amounts set aside for depreciation grew less; and now, when further reductions had been made, depreciation disappeared altogether.

Bailey MACLAY, in reply, said that when they started the undertaking they acquired a lot of old plant which was little better than scrap; and therefore they were forced to write off heavily for depreciation. He thought anyone would see that to-day, with their large new works, which could produce double the current they required, they were in a much better position for improving their circumstances than in the past.

A show of hands was taken; and the motion of Bailie Maclay was adopted by 29 votes to 19.

Fair Wages—The Powers of the Gas Committee.

When the monthly minutes of the Gas Committee were submitted,

Mr. O'HARE said he observed that, at a meeting on Aug. 28, the Committee, by a majority of eight votes to four, agreed to accept offers by the Glenboig Union Fire-Clay Company for the supply of fire-clay bricks, fire clay, and fire-clay retorts. On April 5, 1900, the Council adopted a resolution, moved by Mr. Shaw Maxwell, that contractors should pay their workmen not less than the minimum rate of wages paid in the district, or fair wages. They were all aware that a dispute existed between the Glenboig Union Fire-Clay Company and their workmen. This dispute was principally about miners' wages. The wages paid by the Glenboig Company were not in conformity with the higher rate; and the conditions of labour were not in conformity with the well-known conditions. But it seemed that the Gas Committee ignored the resolutions of the Council. The resolution had been ignored, because at the present moment those men were in the hands of a Union smasher. He moved that the minute be sent back to the Committee, as not being in conformity with the resolution.

Mr. P. G. STEWART seconded, and asked if it was legal for the Corporation to walk through a resolution which they had adopted. The difference between the Glenboig Company and the next lowest offer was somewhere about £500. Would the Council like to feel that they were making this £500 out of unpaid labourers?

Mr. FIFE, as Chairman of the Committee on the day when the offers were considered, said that there was no intimation before the Committee that there was a dispute. Only some mention had been made of it in the newspapers.

Mr. BATTERSBY thought that the Committee, when they were aware of the newspaper reports, should have made inquiry. The resolution was a standing order of the Council; and it was incompetent for the Committee to accept a contract under the circumstances.

Bailie MURRAY asked if, in Corporation specifications, the fair-wage clause was embodied; or was it simply a pious resolution by the Council, which had not been seriously carried into effect?

The LORD PROVOST (warmly): There is no pious resolution of the Council on any subject.

Mr. BOWERS, the Deputy Town Clerk, explained that the clause was inserted in all the specifications which passed through his hands; but it was omitted *per incuriam* from this specification.

Bailie CALDERWOOD said they had been using the same Company's goods for some years; and they did not know that there was a dispute. He asked if the contract had been accepted. [Someone answered "Yes."]

The LORD PROVOST asked if it had been accepted to the extent of binding the Corporation; or was it accepted pending the approval of the Council?

Mr. BOWERS said it had been accepted on behalf of the Corporation, because the Gas Committee had full powers to bind the Corporation in the case of some specific contracts.

Mr. SHAW MAXWELL said it seemed to him that the debate was bringing out a little more than any of them had expected. He could quite understand that, under certain conditions, in certain circumstances, it might be in the public interest that a Committee should have peculiar powers; but these powers should be very clearly indicated.

Sir JAMES MARWICK, the Town Clerk, said he thought it was his duty to intervene here. The Town Council came to a specific resolution; and it was the duty of all the Committees to abide by that resolution. In the present case, under special circumstances, of which he knew nothing, the resolution had been overlooked. It was a pure oversight; but, being an oversight, it had been carried into effect by the Committee. They could not go back upon it now. This should be an illustration to the heads of departments, of the necessity of seeing that the clause be inserted in all their specifications.

Mr. SHAW MAXWELL thought it should not be forgotten that if there was a department of the Corporation which could not be pardoned for the oversight, it was the Gas Committee, because, when he proposed the resolution, an amendment to it was proposed by Mr. R. M. Mitchell, the Convener of the Gas Committee; and the very fact of the Corporation having confirmed the resolution by a majority nearly double that which followed Mr. Mitchell, should have impressed the resolution on their memories.

Sir JAMES MARWICK wanted to say that, while the Committee had powers, it might be absolute powers, those powers must be exercised in conformity with a distinct resolution of the Town Council previously come to.

Mr. O'HARE expressed himself as obliged for the statements by Sir James Marwick, and withdrew his motion.

Mr. SHAW MAXWELL thought they would allow the matter to go, with the assurance that it would not occur again.

Sir JAMES MARWICK said he hoped so; but he could not bind himself for every Committee.

TRANSFER OF SHIPLEY GAS-WORKS TO THE COUNCIL.

The Act of Parliament confirming the agreement for the sale of the undertaking of the Shipley Gas Company to the Shipley District Council having received the Royal Assent, a special meeting of the shareholders in the Company has been held, at which a scheme for the distribution of the purchase money was presented. The price payable by the Council is £228,000; being 30 years' purchase of the maximum statutory dividends payable. The Company will also receive, on the completion of the sale, the balances of the reserve fund and revenue accounts and other items, which will amount, including interest, to £7708. The paid-up capital of the Company is £88,000, of which £48,000 is original stock, bearing a dividend of 10 per cent.; and £40,000 is new stock, with a dividend of 7 per cent. The Directors proposed that the purchase money of £228,000 should be divided among the proprietors in proportion to the maximum dividends. Thus the holders of the 10 per cent. stock will receive £300 for each £100 of stock, and holders of the 7 per cent. stock will receive £210 for each £100 of stock, with interest of 3½ per cent. from the 1st of July last. Further, out of the £7708, the sum of £5320 will be distributed among the proprietors in the same proportions, which will give to the holders of the 10 per cent. stock a bonus of £7 per cent. on their holdings, and to the holders of the 7 per cent. stock a bonus of £4 18s. per cent. The total sum payable to the proprietors will therefore be £307 for each £100 of the 10 per cent. stock, and £214 18s. for each £100 of the 7 per cent. stock. This would leave a balance of £2388 with the current interest on the reserve fund from the 1st of July still to be disposed of. There will be certain costs in connection with the liquidation to be paid by the Company out of this sum; and the Directors suggested that bonuses should be given to the officers and staff of the Company, and that the ultimate balance should be devoted to the Board of Directors for special services, and compensation for loss of office. A resolution to adopt the Directors' scheme was defeated by a majority of the shareholders present; but the proposition was carried when the proxy votes were taken into account. It is understood that a donation £100 is to be given to the Saltaire Hospital.

BIRKDALE AND ITS GAS SUPPLY.

A Conference, re Candle Power, with Southport.

According to a copy which has been sent to us of the "Southport Guardian" for the 18th inst., the previous night, at the Birkdale Town Hall, a conference took place between the Lighting Committee of the Birkdale District Council and the Gas Committee of the Southport Town Council, to consider the suggested alteration in the candle power of the gas supplied to Birkdale by Southport. The high candle power fixed by Act of Parliament can only be obtained, it was pointed out, by artificial enrichment—a course which, while it increases the cost, does not (especially if the incandescent burners are used) improve the light. Hence an agreement whereby the candle power was reduced would, it was felt, diminish the cost of the production of gas at Crowlands, and thus affect the price of the gas supplied in Southport and also in Birkdale. At the conference, Mr. Trounson, on behalf of the Southport Town Council, fully explained the position. Nearly all the local authorities who have obtained Acts of Parliament during the past few sessions have, he said, been allowed reduced candle power; and on this basis the representatives of Southport suggested a new standard of 14-candle power in place of 20 candles, the present standard. On behalf of Birkdale, very reasonable views were expressed; and the conference, which was considered very satisfactory, and which may lead to good results for the inhabitants of both townships, was adjourned in order that some definite proposal might be made for the reduction in the price of the gas supplied to Birkdale—such reduction to be in an equable proportion, and the reduction in the cost of production at Crowlands which would follow the introduction of the lower candle power of 14 as the parliamentary standard.

THE "BUILDER" AND THE LONDON GAS SUPPLY.

Referring to the proceedings in the Gas Section of the Glasgow Engineering Congress, the "Builder" calls attention to the fact that Mr. Livesey, in his presidential address, pointed out that "consumers now have it in their power to get out of 5 cubic feet of gas per hour anything from 5 to 150 candles from ordinary coal gas, whether it be nominally 10, 15, or 20 so-called candle-power," and exclaimed, "What a useless absurdity does this make of all illuminating power tests!" Our contemporary quite agrees that, owing to the introduction of the incandescent gas-light and the extensive use of gas for heating, the so-called illuminating power has become a matter of secondary importance as compared with heating power; but until Parliament has fixed a standard calorific value to take the place of the present illuminating power standard, it would be inimical to the interests of gas consumers to allow the illuminating power tests to be abandoned. Proceeding, the "Builder" remarks: "Professor Vivian B. Lewes read a paper on 'The Utilization of Water Gas in the Destructive Distillation of Coal,' in which he described a new method of gas manufacture by which low-grade gas of high calorific value can be made more cheaply than has hitherto been possible. The coal is heated in retorts in the usual manner; but while carbonization is being carried on, a rapid stream of non-luminous water gas is passed through the retorts in order to push the coal gas out of the zone of heat before its richest illuminating hydrocarbons have been decomposed into products of less value. By adding 40 per cent. of water gas (costing 3½d. per 1000 cubic feet) in this manner, a mixture is obtained which has a heating value about 15 per cent. lower than ordinary coal gas of good quality, and an illuminating power about 1½ candles lower. The ordinary consumer would probably not detect any difference between this mixture and ordinary coal gas. In view of the excessive cost of the gas supplied by the Gas

Light and Coke Company on the north side of the Thames, it is to be hoped that this Company will lose no time in obtaining parliamentary sanction for a reduction of the standard illuminating power, and by adopting this new process make a substantial reduction in the price charged to consumers. The economy effected by the new process has been found, by working on a fairly large scale, to be 2s. 1d. per ton of coal carbonized; and as the quantity of coal used by the London Companies amounts to 4 million tons per annum, the economy effected in London alone would exceed £400,000 a year."

BOLTON CORPORATION GAS, ELECTRICITY, AND WATER DEPARTMENTS.

The abstract of the 1900-1 accounts of the Treasurer of the Bolton Corporation (Mr. George Swainson) has been issued; and he has succeeded in so clearly arranging his statistics that they are capable of ready reference. Turning to the figures relating to the Gas Department, it is found from the revenue account that the cost of the coal and cannel carbonized went up from £54,136 to £73,664; while, on the other hand, the amount derived from the sale of gas rose from £109,000 to £117,000. This may be attributed to gas having increased in price from 2s. 3d. to 2s. 5d. per 1000 cubic feet. Looking next at the amount realized for coke, one expects that as coal went up in price, the price of coke would follow; and this proves to be the case—this item going up more than £9000 in comparison with 1900. The profit allocated in aid of the rates—£20,000—compares very unfavourably with figures for 1895 (£23,478), 1896 (£21,432), 1897 (£24,057), 1898 (£26,466), and 1899 (£25,000); and it is feared from the decrease in the price of residuals that more than £20,000 cannot be expected for the current year. It is noticed that the Committee have spent above £6000 on renewals of works, which for years now have been constantly improved out of revenue until their real value is considerably more than the amount at which they stand in the books. This is a very healthy and sound position. The same remark applies to the Electricity Department, in which the Committee this year for the first time have written off the large sum of £5881 for depreciation—£1800 more than the Local Government Board require them to repay of their debt. The profit made last year was only small (£857). The revenue has gone up from £9498 to £12,444 for lighting; and for the first time there is an account of a complete year's supply of electricity to the Tramways Committee, the amount for which is £10,107. The income of the Water Department is gradually creeping up, although not to any great extent. The meter consumption rose during the year from 816 to 824 million gallons.

OTTOMAN GAS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the London Offices, No. 9, Queen Street Place, E.C.—Colonel JAMES LE GEYT DANIELL in the chair.

The SECRETARY (Mr. Thomas Guyatt) having read the notice convening the meeting,

The CHAIRMAN thanked the shareholders for the sympathetic expressions used towards himself on the occasion of his absence at the last meeting. There he was ably represented in the chair by Mr. Charles Gandon, who, while congratulating the shareholders upon the prosperous condition of the Company, cautioned them not to anticipate the same favourable result in the then coming half year, as the increased cost of coal would necessarily fall heavily upon it. In a forecast of the future in a business like theirs, caution was a very valuable quality. He was, however, happy to see that the report on the operations of the half year went beyond the most favourable anticipations that any of them could possibly have formed. Notwithstanding that coal had cost during that period £1527 more than in the corresponding half of 1900, and notwithstanding the fact that it was a summer half year, and that no advance in the price of gas was made, it was gratifying to find that the business had shown such powers of elasticity (of which their active and zealous Manager, Mr. John Gandon, had not been slow to take advantage), that they had made a net profit which was only £556 less than the corresponding period of last year. The rental from public lighting was £400 more, and from private consumers £681 more. This was a result that must be considered eminently satisfactory. Two of the Directors (Mr. Gandon and Mr. Andrews) had paid visits to Smyrna of a private character, having interests, friendship, and connections out there. They were, however, men who kept their eyes open, and they were careful to see how things were going on in Smyrna, so far as the Company were concerned. From conversations he had had with them, he felt sure the Company's interests had been much benefited by their visits. A review of the details of the accounts might not be without interest. Taking the balance-sheet, the increase in the debentures represented £1000 out of the £5000 issued and taken up. This £1000 was paid in June; and therefore it had to come into the account. Compared with June, 1900, sundry creditors appeared as £2958 more. The items under the heads of mains, gas-engines, Ottoman Railway, and coal more than accounted for this. The depreciation fund invested was some £1153 more. On the other side of the account, they had added during the six months £1139 to capital, under the conditions of the new public lighting contract, which had been explained on previous occasions. Then sundry debtors stood at £8166, as against £8857. The disappearance of the suspense account, alluded to last February by Mr. Gandon, would more than account for the difference. For public lighting, there was £529 more owing, and for private consumption £307 less. The stocks stood at £1060 less. The depreciation fund invested was £2813; and this had since been increased by the investment of £564 in Consols. Cash and bills totalled to £2868. Coming to the revenue account, the principal item was coal, which cost £5702, against £4175. A reference to other smaller changes in expenditure, led him to the receipts. The gas-rental, he said, was a very satisfactory item. The amount received was £11,091, as against £10,009. The bye-products yielded £2722, as compared with £2652. Personally, he was rather surprised that the receipts for residuals were not more; but, of course, they could not make them so. The profit on fittings, &c., was £531, compared with £578. Taking the balance brought forward from the previous half year, and adding the net profit for the past half, made £3341; and he thought the shareholders would agree with him that, under all the circumstances, this was a very satisfactory result. It enabled them to pay a dividend at the rate of 7 per cent. per annum, amounting to £2625. Regarding the manufacturing operations, the increase in the quantity of coal used was about 500 tons. The total amount of gas made was 41,660,000 cubic feet, as compared with 35,732,000 cubic feet. The number of public lamps was 276 more than in the corresponding period of last year. He thought, if he remembered rightly, the shareholders had been prepared for an increase in capital if this large rise in the demand continued. The Board had not yet had occasion to discuss the matter; but he hoped the shareholders would keep it in mind. He then formally moved the adoption of the report and accounts.

Mr. C. GANDON, in seconding the motion, said that, on the occasion of his visit to Smyrna in the Spring, he was much surprised at the progress the Company were making, especially in view of the dull state of commerce generally. He thought that very few undertakings in Smyrna had progressed so much as their own had done just recently. This was very satisfactory from their point of view; and they might congratulate themselves upon it. He hoped it would continue. There was another point that was satisfactory. Though they appeared to have made sufficient money to pay the dividend, few other gas companies had done so, in consequence of the large increase in the cost of coal; and the Directors hoped to get—in fact, they could now state they would get—both coal and freights at a lower price.

The motion was unanimously carried.

The CHAIRMAN proposed a dividend for the half year at the rate of 7 per cent. per annum, free of income-tax.

Mr. H. W. ANDREWS, in seconding the motion, said that, having been in Smyrna since Mr. Gandon, he could emphasize what he had stated. The two things that struck him (Mr. Andrews) most were these: First, the enormous increase in the population; and, secondly, the great increase in the gas-rental. Since he left Smyrna in 1890, the private rental had increased 77 per cent.

The proposition was agreed to.

Mr. J. L. CHAPMAN, in moving a vote of thanks to the Chairman and Directors, mentioned that it was a very extraordinary thing in connection with foreign gas companies (he found the same thing in the Tuscan Gas Company) that, although they paid a higher price for coal, they did not receive a much increased price for coke.

Mr. F. W. BROTHERS seconded the motion, Mr. A. W. OKE supported it, and it was carried unanimously.

The CHAIRMAN having responded, a similar acknowledgment of the services of the officials was made; and to this Mr. GUYATT replied.

SINGAPORE GAS COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C., to confirm resolutions for the winding-up of the undertaking, which were agreed to at the extraordinary meeting on the 29th ult. Mr. SAMUEL SPENCER, the Chairman of the Company, presided.

The SECRETARY (Mr. R. M. Christie) having read the notice convening the meeting, and the minutes of the previous meeting,

The CHAIRMAN said that, before putting the resolutions, he should like to remark that on March 22, 1862, the Company was created. During the 39½ years of its existence, the shareholders had, he wished to repeat, received on the £64,300 of ordinary capital, the miserable return of 4¼ per cent.; and the concern was now being taken over by the Municipality at a figure that would not give them back 60 per cent. of their capital. He ventured to say that this result should be a warning to all English companies embarking their capital in foreign or colonial undertakings; and that if they could not secure better terms than the Singapore Gas Company had had to put up with, it would be far wiser to decline to enter into such bargains, as the money invested in Consols would be quite as profitable. He might mention that during the whole of the Company's career, they had fulfilled all their obligations; and they had never had a well-founded complaint about their proceedings. The end had now come; and, under the circumstances, there would be for division, after paying off the debentures and debts, a sum in excess of what a year or so ago they hoped to receive for distribution among the ordinary shareholders. At the extraordinary meeting on the 29th ult., he mentioned that the Board received 4423 votes from 79 shareholders in favour of the resolutions, and 4118 votes from 30 shareholders against them. For the present meeting, the Directors had had sent to them 4718 votes from 76 shareholders for the resolutions, and none against them. He therefore hoped that the meeting would be unanimous in confirming the resolutions passed on the last occasion. He concluded by proposing that the minutes of the last meeting be confirmed.

Mr. H. W. SMITH seconded the motion, and it was thereupon agreed to.

The CHAIRMAN then separately moved, and Mr. SMITH seconded, the four resolutions passed at the previous meeting—(1) that the Company be wound up, (2) that the conditional agreement between the Company and the Municipality be confirmed, (3) that certain sums be paid to the Secretary, Accountant, and Engineer, and (4) that the Liquidator be authorized to pay the Directors 400 guineas for their services as from the annual meeting in May last.

The first two resolutions were carried unanimously; but before the third was put to the meeting,

Mr. CRISP said he wished to protest. It seemed to him that the suggestion to compensate the officers should come voluntarily from the shareholders, and not compulsorily from the Board.

The CHAIRMAN pointed out that it was, even at the present moment, a voluntary question for the shareholders, and they could do what they liked in the matter.

Ultimately the third and fourth resolutions were carried, with one dissentient.

Mr. SAMSON proposed, and Mr. ALDERSON seconded, a vote of thanks to the Chairman and Directors; the former gentleman saying that he wished to impress upon the Chairman the necessity of being as careful as possible over the liquidation, so as to keep expenses down.

The CHAIRMAN, in thanking the shareholders, on behalf of himself and his colleagues, for the vote, said that the Board had had a great deal to do to bring about the result that had been achieved; and if they had not held together as they had done, the proprietors would very likely at the present time have been getting back only 30 per cent. of their capital, instead of the 60 per cent. they would in all probability receive.

On the motion of Mr. SMITH, seconded by Mr. GUYATT, a vote of thanks was accorded to the officers, who, it was remarked, had exerted themselves to the very utmost in the service of the Company.

The SECRETARY returned thanks, and the proceedings terminated.

ELECTRIC LIGHTING NOTES.

Last Wednesday, Mr. A. A. G. Mabs held an inquiry at Nelson, on behalf of the Local Government Board, into an application by the Corporation to borrow £25,000 for electric lighting purposes. The works will, it was stated, provide current for running a tramway and two light railways in the district.

An inquiry was held at Middlesbrough last Tuesday by Mr. W. O. E. Meade-King, on behalf of the Local Government Board, into the application of the Corporation for leave to borrow £34,100 for electric lighting purposes—the loan to extend over 30 years. It was explained that powers had previously been granted for the borrowing of £36,000 over a period of 25 years; and the present application was for extensions—£21,000 being needed to provide additional plant and mains. The application was not opposed.

Last Tuesday's meeting of the Cardiff Electricity Committee had under consideration a report by their Engineer and Manager (Mr. A. Ellis) on the question of free-wiring. He did not recommend the Corporation to actually do the wiring, as they had in the town about a dozen contractors, and they made excellent canvassers. The Corporation would receive tenders and pay the price and then charge the consumer interest on the outlay. This was practically the only way, he said, as the Board of Trade would not grant corporations powers to do free-wiring.

The Pontypridd Guardians at their meeting last Wednesday, had before them a report from the Committee specially appointed to examine tenders for the electric lighting of the Workhouse. It stated that they did not feel justified in recommending the Guardians to adopt electrict lighting, which would cost £1520 for installation, and an annual maintenance cost of £360; whereas the present cost of lighting the Union by gas (including a gas-stove) was only £119 per annum. On a motion made, that the Guardians should adopt electric lighting, 30 voted for the adoption of the Committee's report, and 3 for the amendment, which was therefore lost.

The Worthing Corporation electric lighting works, erected on the site of the old water-works, were opened on Saturday by the Marquis of Abergavenny, the Lord Lieutenant of Sussex. Distributing mains have been laid in all the chief business and residential thoroughfares of the town; and the Corporation have received a considerable demand for the new light—the applications from private consumers being said to be equivalent to about 3000 eight-candle power lamps. The street lighting has involved the erection of 110 arc lamps, each of 1000-candle power; and on the sea-front the standards are only 45 yards apart. In the evening, the Mayoress (Mrs. Ovenden) switched on the current to the street lamps.

A scheme of free-wiring for the electric supply of private houses has been proposed for Wolverhampton, which has a common-sense look about it. It is intended that the work shall be carried out by local contractors, who are to be paid by the Corporation the net cost of material and labour, *plus* a certain percentage for profit. The Corporation will connect premises within twenty yards of a main cable free of cost, and fix free all necessary meters, indicators, terminal boxes, and cut-outs required. Any number of plain fittings will also be fixed free of cost. When complete, the consumer may hire the installation from the Corporation upon the hire-purchase system for three, five, or ten years, and pay for it in three, five, or ten annual instalments, each of which shall be one-third, one-fifth, or one tenth of the net cost of the installation, *plus* an annual payment for interest. Upon payment of the last instalment, the installation will become the property of the consumer. If the Local Government Board refuse to grant a loan of £1000 to meet the first cost, it is suggested that the revenue of the department should bear the preliminary expense.

The Walsall Corporation had several topics connected with their Electric Light Department brought before them yesterday week. In the first place, cable extensions were recommended at a cost of £1700; and then the Committee gave the Council some information as to an application from the Wednesbury Corporation for the supply of electricity in bulk. As this would entail a cost of £8000, and it would be necessary for Wednesbury to enter into a contract for 25 years, the Committee did not feel they could offer any terms that would be of advantage to their neighbours. The price charged for electricity was also under consideration; and the Committee recommended that the hours for which the maximum load was charged at 6d. should be reduced from 273 to 230, and that the hours for power use be reduced from 300 to 200. In the discussion on the report, Alderman Holden tried to get the question of the price referred back—pointing out that certain large firms produced their own electricity at ½d. per unit, and contending that what could be done by private firms could be done by the Corporation. However, the report was adopted.

The electricity works built by the Worksop Urban Council were opened last Tuesday evening. The buildings erected consist of a boiler-house, to accommodate four Lancashire boilers, of which two have been fixed at present, raising steam up to 600-horse power; an engine-room for two 100-kilowatt plants, and three of 150-kilowatt capacity, with the necessary accessories. The plant at present fixed is sufficient to generate electricity for 11,600 lamps of 8-candle power, and there are accumulators provided. At the opening ceremony the guests were received by Mr. J. T. Shardlow (Chairman of the Urban Council), and among them were the Mayors of Retford, Mansfield, and Newark, and the Chairmen of several Urban Councils. Mr. Shardlow was presented by Mr. A. B. Mountain, the Consulting Engineer, with a gold key as a memento of the occasion. Subsequently dinner was served in the Town Hall. The Chairman of the Electric Lighting Committee, in responding to a toast, said that the cost of the works had been £15,000, and 72 applications had been received for the supply of electrical energy—equal to 2000 lamps of 8-candle power—and three for motive power. The commencement was thus considered most auspicious, and the success of the undertaking was certain.

The Blyth and Cowpen Gas Company are making a good bid for increased business in the coming winter. They have given the consumers notice of a reduction of 7d., to 3s. 2d., less a discount of 5 per cent. Prepayment meter consumers are to be allowed 22 cubic feet for 1d. The Company also advertise their willingness to fix hired cookers free within 40 feet of the meter, and to give purchasers of cooking and heating stoves 15 per cent. off list prices. We make this announcement here because accompanying the notice of the reduction is a little comparison which may be found useful as a pattern in other towns. It is headed "Gas Lighting *v.* Electric Lighting;" and then it proceeds: "After the reading of meters, which will take place in September, the price of gas, for all purposes, will be reduced to 3s. 2d. per 1000 cubic feet, less a discount of 5 per cent. for prompt payment; thus making the price of gas 3s. per 1000 net. The minimum charge for electrical energy for lighting purposes will be 4d. per Board of Trade unit. One Board of Trade unit is capable of lighting nine 32-candle power lamps for one hour at a cost of 4d. Twenty cubic feet of gas are capable of lighting nine 32-candle power lamps for one hour at a cost of about ¾d. These figures clearly show that electricity for lighting purposes will cost over five times as much as gas. To the 'penny-in-the-slot' consumers, the Gas Company will, during October, alter the meters so as to allow 22 cubic feet for 1d.; and this quantity of gas, with an incandescent burner, will light one lamp for seven hours."

Mr. D. T. Livesey, the Engineer of the East Grinstead Gas-Works, is a capital and convincing debater of matters connected with his professional work; and he has just given renewed evidence of this in the local Press. The question of introducing the electric light is now engaging the attention of the rulers of the town; and they have had reports on the subject which they are about as capable of examining as the man in the moon. But Mr. Livesey has come to their aid; and we think the District Council must acknowledge, unless they are lamentably blind, that he has considerably damaged the face of their expert's reports. He walks into the question with some well-placed remarks on municipal trading, then compares the expert's figures with the averages of four of the nearest electrical installations—viz., Hastings, Eastbourne, Tunbridge Wells, and Guildford; following this up with a comparison of incandescent gas and electric light; and finally gives some easily provable facts relating to electric lighting in other towns. Readers of the "JOURNAL" need not be taken all through the figures in the letter; but it is interesting to note the balance sheet which Mr. Livesey evolves by taking "the only safe criterion"—the experience of others. He finds that there will be a balance loss on the working of the East Grinstead undertaking of £561; and adding to this 4 per cent. on £12,000 for depreciation, £480, gives a total deficit of £1041. Will East Grinstead take this risk? In the same paper, Mr. R. Whitehead shows the ratepayers, from the statistics given in the Board of Trade Returns, that, out of 49 electric light undertakings owned by municipalities, only 17 pay their way; and these include the largest towns.

Walthamstow is now in possession of an electric lighting station, the fortunes of which, for more than one reason, will be watched with interest both in the gas and the electrical world. In the first place, the information before us shows that the new installation (for which powers to borrow £41,000 were granted two years ago) is to be run on plain business lines. But to us its most interesting feature is the motive power that has been adopted. Two Dowson gas generators have been installed; and these will supply at present three gas-engines (each of about 100-horse power), with dynamos coupled direct. The cost of the gas is calculated at 2d. per 1000 cubic feet; and 4000 cubic feet of it for the purpose of motive power are given as the equivalent of 1000 cubic feet of ordinary lighting gas. Two more gas-engines, each of 250 electrical horse power, are on order. Twelve months or so hence, Walthamstow should furnish data with which some instructive comparisons may be made with other stations as to working costs. The generating station covers 2 acres of land. There is already a demand, it is said, for private lighting equal to nearly 15,000 eight-candle power lamps. The principal streets are lighted by 63 arc lamps, each of about 1400-candle power; two 16-candle power glow lamps being attached to each arc lamp column, for use after eleven o'clock at night. In the side streets, however, the gas-jets will, as soon as possible, be replaced by glow lamps. Specifications are in hand for electric trams, which will cover a distance of 15 miles; and provision has, therefore, been made for adding to the capacity of the new works. The scheme of the Council is estimated, when complete, to cost about £250,000. The charge for lighting is fixed at 5d., 4½d., and 4d. per unit, according to the quantity consumed per annum, while that for electricity for power is 2½d. At the invitation of the Council, a large company attended the opening ceremony on Friday. Mr. J. R. Friend (Chairman of the Electric Lighting Committee), who presided, said that many people thought the Council were wrong in having gas-engines fitted; but they had had three trials of their present engines, which had been running for the last two or three months with every success.

A Water-Gas Plant for Smethwick.—At last Tuesday's meeting of the Smethwick Town Council, the Gas Committee reported that, in order to meet the continual increase in the demand for gas, they had accepted the tender of the Economical Gas Apparatus Construction Company for the installation of a water-gas plant of a productive capacity of 500,000 cubic feet per day. It is hoped to have the plant laid down and at work by the end of November.

MANCHESTER CORPORATION WATER SUPPLY.

The position of the water supply of Manchester continues to receive the serious attention of the Water Committee and their officials. At a recent meeting, the Chairman of the Committee (Sir J. J. Harwood) stated that a large number of letters had been received complaining of defective taps and fittings, and alleging that taps were constantly left running, with the result that a large volume of water was allowed to go to waste. The Committee were of opinion that there might be some ground for these allegations, and told off a number of special inspectors some time ago to make a house-to-house inquiry over certain districts, for the purpose of ascertaining the exact state of affairs. From an inspection of the fittings of above 46,000 houses, it was found that leakage of which any serious notice need be taken occurred in 12 per cent. of the houses visited. The Committee, therefore, were of opinion that the fittings as a whole were in a much better condition than they had been led to anticipate. They think it is sufficiently obvious that, in a large community like Manchester, there must always be an appreciable percentage of defective fittings. Many suggestions with regard to the drought have been received by the department; and upon one of them the Committee feel obliged to make some reply. It is alleged that the closing of the mains from eight to five o'clock does not result in any appreciable saving of water; whereas the fact is that the net gain amounts to 5 million gallons per day, or 30 million gallons per working week. Everything possible to economize the water that still remains, and to ensure a continuation of its quality, is being done. It was pointed out that it is eight years since the city experienced a similar short supply of water. But the possibility of such a contingency has been in the minds of the Committee all along, with the result that early in the current year preparations were made to meet it by filling up all the reservoirs. As previously stated, the Committee have decided to push on the work of laying a second pipe from Thirlmere, instead of consuming valuable time by laying two pipes concurrently. The laying of the single pipe, however, cannot be completed under two years, and may take longer.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Corporation of Glasgow, in their Gas Department, have scaled the heights of another year. It has been uphill work for them; but they have the satisfaction of knowing that circumstances are now more agreeable, and that, barring any untoward event, they will be able to make up the loss which has been sustained. That loss has been considerable—amounting to over £50,000. It is very clear how it was incurred. Coal cost £145,000 more than in the year preceding, though only 11,000 tons more were used; and the increased price of gas brought in £95,000 more. It is a rough way to put it, but the difference between the two sums is almost the amount of the deficit upon the year's working. It would be interesting to know who benefited by the augmented burden of £145,000 which was laid upon the consumers of gas in Glasgow. It did not all, by any means, reach the pockets of the producers of coal. The Corporation paid 4s. 1d. per ton more than they did the year before. A coal miner hews about 3 tons of coal per day. Certain it is that the miners did not get 12s. per day added to their wages. Increased wages paid to miners was not, therefore, the cause of the rise in the price of coal. It must be sought for somewhere else. A good market gave the opportunity for it; and the coalowners did the rest. What splendid fortunes some of them must have made. Political economists tell us that prices are regulated by the laws of supply and demand. But the rule is not universal; it is sometimes possible, as in the case of coal last year, to create an artificial value. There is comfort in this, however, that only for a little time does such a movement last. The incident is over, and all we can do now is to regret that it should have been possible to so handle the market as to oblige communities to pay about one-third more than the actual value of a staple article of trade. It is a reflection not unmingled with sadness, that a great Corporation like that of Glasgow should be helpless when engulphed in a sinister movement such as that which forced up the price of coal. It is when presented to us in such great volume as we have here, that the full effect of last year's doing is brought home to us. This is only the fourth time in 31 years that there has been a deficit in the gas accounts; but this year the amount is more than double the highest of the former debits. The Corporation treat it as only a passing incident, which will disappear in the course of the present year. For this hope they have good ground, both from experience and from reasonable estimate. They have not abated one jot or tittle of their ordinary policy. All their financial arrangements—sinking fund contributions, allowance for depreciation, and the like—have been provided for as if the year had ended with a surplus. This speaks eloquently of the confidence which the Corporation place in the Gas Committee, and which the Committee place in the management of the undertaking. Both are warranted in their confidences. The undertaking is thoroughly sound, financially and otherwise; and every year it is obtaining a firm hold upon the community, which means that the community, being well served, are reciprocating freely to the offer of service made by the Gas Committee. At the Council meeting on Friday,* the report of the Committee and the accounts of the undertaking for the past year were adopted with unanimity. This is a point of much moment, because in a business so vast as the gas undertaking of Glasgow, there must be many matters on which discontent might arise through inconveniences (and even grievances) being sustained by others. This possibility is greatly magnified when it is remembered that there are over seventy members of the Town Council, who represent many and varied interests. To manage an undertaking which owns a capital of more than £1,500,000, and which has the names of more than 200,000 customers on its books, without giving occasion for protest or even grumble, is, to say the least

* See p. 793.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 784.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME	Closing Prices.	Rise or Fall in Wk	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 12	10½	Alliance & Dublin 10 p.c.	19½—20½	+1	4 17 7
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	July 1	5	Australian 5 p.c. Deb. .	100—102	..	4 18 0
200,000	5	May 15	6½	Bombay, Ltd. . . .	6⅜—6⅝	..	4 16 4
40,000	5	,,	6½	Do. New, £4 paid	4⅜—4⅝	..	5 9 5
380,000	Stk.	Aug. 15	12	Brentford Consolidated	262—267	..	4 9 11
270,000	,,	,,	9	Do. New . . .	190—195	..	4 12 4
50,000	,,	,,	5	Do. 5 p.c. Pref. .	126—130	..	3 16 11
206,250	,,	June 14	4	Do. 4 p.c. Deb. .	111—114	..	3 10 2
220,000	Stk.	Sept. 12	10	Brighton & Hove Orig.	220—225*	..	4 8 11
246,320	,,	,,	7	Do. A. Ord. Stk. .	153—158*	..	4 8 7
1,047,500	Stk.	Aug. 28	5	Bristol, 5 p.c. max. .	116⅝—117½	..	4 5 1
420,000	20	Mar. 28	10	British.	41⅝—42⅜	..	4 14 1
50,000	10	Aug. 15	12	Bromley, Ord. 10 p.c. .	24—26	..	4 12 4
82,850	10	,,	9	Do. 7 p.c. . . .	19—21	..	4 5 8
500,000	10	May 31	6	Buenos Ayres (New) Ltd.	9—9¼	..	6 6 4
220,000	Stk.	June 28	4	Do. 4 p.c. Deb.	94—97	.	4 2 6
150,000	20	July 17	8½	Cagliari, Ltd. . . .	22—24	..	6 17 6
100,000	10	May 31	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	53—55	+1	5 9 1
550,000	Stk.	Apl. 12	12	Commercial Old Stock	270—280	..	4 5 9
236,425	,,	,,	9	Do. New do. .	205—210	..	4 5 9
238,237	,,	June 14	4½	Do. 4½ p.c. Deb.	130—135	..	3 6 8
800,000	Stk.	May 31	9	Continental Union, Ltd.	162—167	..	5 7 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	162—167	..	4 3 10
575,000	Stk.	Aug. 29	5	Crystal Palace Ord. 5 p.c.	122—127	..	3 18 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—128	..	3 18 2
486,090	10	July 17	10½	European, Ltd. . . .	19—20	..	5 5 0
354,060	10	,,	10½	Do. £7 10s. paid	14—15	..	5 5 0
15,079,885	Stk.	Aug. 15	4 1/10	Gas-light and Coke { 4 p.c. Ord. . .	96—98	+1	4 9 9
2,600,000	,,	,,	3½	3½ p.c. max. .	88—90	..	3 17 9
3,799,735	,,	,,	4	4 p.c. Con. Pref.	111—114	..	3 10 2
4,063,425	,,	June 14	3	3 p.c. Con. Deb.	91—93	..	3 4 6
70,000	10	May 31	8	Hongkong & China, Ltd.	13—14	..	5 14 4
3,800,000	Stk.	May 15	10	Imperial Continental .	210—213	+1	4 13 11
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	99—101	..	3 9 4
561,000	Stk.	Aug. 29	10	Liverpool United A	231—233	..	4 5 10
718,100	,,	,,	7	Do. do. B	170—172	..	4 1 5
306,083	,,	June 28	4	Do. do. Deb. Stk.	119—120	+½	3 6 8
75,000	5	June 14	4	Malta & Medn., Ltd. .	4⅜—5	..	4 0 0
560,000	100	Apl. 1	5	Met. of { 5 p.c. Deb.	106—109	..	4 11 9
250,000	100	,,	4½	Melbourne { 4½ p.c. Deb.	104—106	+1	4 4 11
541,920	20	May 31	3½	Monte Video, Ltd. . .	9—10	..	7 0 0
717,946	Stk.	Aug. 9	8½	Newc'tle & G'tesh'd Con.	224—226	..	3 15 3
312,855	Stk.	June 28	3½	Do. 3½ p.c. Deb.	97—99	..	3 10 8
150,000	5	May 15	8	Oriental, Ltd. . . .	7⅜—8¼	..	4 17 5
135,000	5	,,	8	Do. New, £4 10s. pd.	7—7⅛	..	4 16 0
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1⅜ *Ex. div.	..	4 11 5

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
60,000	5	Feb. 28	7	Ottoman, Ltd. . . .	5⅞—6⅛	..	5 12 0
851,070	10	Apl. 26	7	River Plate Ord. . .	10⅝—11¼	..	6 4 5
250,000	Stk.	June 28	4	Do. 4 p.c. Deb..	96—98	..	4 1 8
250,000	10	Mar. 28	8	San Paulo, Ltd.. . .	11—12	+½	6 13 4
135,000	Stk.	Sept. 12	10	Sheffield A	237—242*	..	4 2 8
209,984	,,	,,	10	Do. B	237—242*	..	4 2 8
523,498	,,	,,	10	Do. C	237—242*	..	4 2 8
5,761,885	Stk.	Aug. 15	5	South Met., 4 p.c. Ord.	125—128	..	3 18 2
1,627,965	,,	July 17	3	Do. 3 p.c. Deb. . .	91—94	..	3 3 10
380,940	Stk.	May 15	5	Southampton Ord. . .	106—111	..	4 10 1
70,825	,,	July 17	4	Do. 4 p.c. Deb.	104—109	..	3 13 5
120,000	Stk.	Aug. 29	5½	Tottenham and Edmonton { A. 5 p.c. B. 3½ p.c.	115—120* 85—90	..	4 11 8 4 8 11
250,520	,,	,,	4				
182,380	10	Jan. 16	5	Tuscan, Ltd.. . . .	8—9	..	5 11 1
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	95—100	..	5 0 0
230,000	5	Aug. 15	9	West Ham, 10 p.c. . .	9⅞—10⅞	..	4 5 9
172,000	10	,,	6	Do. 7 p.c. . .	12—13	..	4 12 4
140,900	Stk.	June 28	4	Do. 4 p.c. Deb.	103—108	..	3 14 1
				WATER COMPANIES.			
780,599	Stk.	June 28	11	Chelsea, Ord. . .	295—300	..	3 13 4
150,000	,,	,,	5	Do. 5 p.c. Pref. .	150—155	..	3 4 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	137—142	..	3 3 5
175,785	,,	Mar. 28	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
1,720,560	Stk.	Apl. 12	7	East London, Ord.. .	188—193	..	3 12 6
654,740	,,	June 14	4½	Do. 4½ p.c. Deb. .	143—148	..	3 0 10
980,169	,,	,,	3	Do. 3 p.c. Deb. .	95—97	..	3 1 10
700,000	50	June 14	8	Grand Junction { 10 p.c. max.. 4 p.c. Deb..	107—110	+1	3 12 9
310,000	Stk.	Mar. 28	4		123—127	..	3 3 0
708,000	Stk.	Aug. 15	14	Kent	283—288	+3	4 17 3
160,000	,,	,,	7	Do. New, 7 p.c. max..	200—205	..	3 8 4
1,043,800	100	June 28	10½	Lambeth, 10 p.c. max..	275—280	+2	3 15 0
406,200	100	,,	8	Do. 7½ p.c. max..	207—212	..	3 15 6
350,000	Stk.	Mar. 28	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
500,000	100	Aug. 15	12 1/10	New River, New Shares	392—397	..	3 4 6
1,000,000	Stk.	July 31	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
902,300	Stk.	June 14	6	South-wark and { Ord. . . . 7½ p.c. max. 5 p.c. Pref. .	178—183	+3	3 5 7
126,500	100	,,	6		167—172	+2	3 9 9
489,200	Stk.	,,	5		147—152	..	3 5 9
1,019,585	,,	Apl. 12	4	Vauxhall 4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	June 14	10	West Middlesex. . . .	272—277	..	3 12 3
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	138—143	..	3 2 11
200,000	,,	Sept. 12	3	Do. 3 p.c. Deb. .	94—97* *Ex. div.	..	3 1 10

of it, a state of matters which should make the Corporation proud of those who serve them.

There was a little breeze in the Town Council over the letting of the contract for fire-clay goods. Through an omission on the part of whoever drafted the specification of the goods for which tenders were sought, the fair-wage clause was not inserted; and then it turned out that the contract was given to the Glenboig Union Fire-Clay Company, who at present have a dispute with their miners about wages. The working men representatives in the Town Council were quick to detect this, and to raise objection to the contract. Their objection came to nought, as the contract has been completed, and is in process of being executed. Sir James Marwick, the venerable Town Clerk, laid it down as the duty of all Committees to insert the fair-wage clause in every contract. This is the only important point in the matter; and it is important chiefly for the reason that it is far from being an affirmation that fair wages must be paid. Who is the judge of whether fair wages are being paid? Workmen would say they should decide, but that is a position which is untenable. So also would be a claim on the part of the employers to determine what were or what were not fair wages. In this case, the Gas Committee might have come to the conclusion that fair wages were being paid, and who should say them nay? And when should objection be taken? Clearly not after the contract was completed; for then the penalty clause for failure to implement would come into force. If before the contract was completed, it would be necessary that in advertisements for offers the workmen in the employment of offerers should be called upon to say whether their wages were fair or not. This would be intolerable; and therefore, notwithstanding that the insertion of the clause is imperative, and that, according to Lord Provost Chisholm, the Town Council never adopt "pious resolutions," this one is little more than such, and in practice will be found not to interfere with the discretion of Committees in the selection of contractors.

Early on Wednesday morning an earthquake, of short duration but of considerable severity, was experienced in the northern and north-eastern districts of Scotland. I expect that such an occurrence would seriously affect gas and water pipes; but as yet I have not heard of damage having been discovered. If leaks begin to be found, there should be no difficulty in attributing them to the earthquake.

The Corporation of Falkirk this week adopted the estimates for the current year, in connection with their gas undertaking, and agreed to reduce the price of gas from 3s. 4d. to 2s. 9d. per 1000 cubic feet. They also resolved to give smaller discounts to large consumers. Provost Weir moved that, in lieu of an advance in salary to the Manager (Mr. J. Kincaid), they allow him to occupy his present house, which is the property of the Corporation, free of rent and taxes, and that they give him coal and gas free. In support of the motion, it was stated that this would bring the salary up to what Mr. Kincaid's predecessor had; that the make of gas had increased since 1897, from 98 to 123 million cubic feet per annum; that though the make had thus increased, the extra cost to produce it had only been £6 13s.; that it cost 1s. 4d. per 1000 cubic feet to meet the capital charges; that therefore the net cost of gas in Falkirk was only 2s. per 1000 cubic feet, which compared more than favourably with the cost in other places; and that they had the question of providing new gas-works before them. In opposition to the proposal, it was urged that the time was inopportune for giving a rise in salary to the Manager, who, however, all admitted, had done most excellent work during the two years he had been in Falkirk. The Provost's motion was adopted by nine votes to three.

By an act which he regards as meritorious, but which, when looked closely into, was neither more nor less than the requiring of others to exercise self-denial, Mr. Robert Menzies, the Convener of the Cleaning and Lighting Committee of the Edinburgh Town Council, has saved the community £400. This was accomplished by the simple process of directing that during the summer months about one-half of the gas-lamps in the streets should be extinguished at midnight. The lighting account is about £26,000. To have saved £400 upon this amount is no great accomplishment. But the strange thing is that it was the gas lighting service of the city which was selected for the display of municipal smartness that led to the saving of the money. There was a wide field in the electric lighting service, which was untouched. The fit of economy was the outcome of well-grounded fear, for it is announced to-day that the assessments are to be raised by 2¾d. per pound, which is due to the extravagant schemes in which the Corporation have been indulging.

The valuation season has passed without much occurring of interest to owners of gas-works. Only at one place, so far as I can learn, has the subject been brought up. This was at Peebles, where a new Assessor was appointed a year ago He raised the valuation of the gas-works from £124 to £580. The Treasurer to the Gas Commissioners (Mr. W. H. Williamson) appealed. He founded his argument on the Kinross and Milnathort Gas Company's case, in which it was laid down that the basis of valuation of a gas-works should be the amount of profit earned, with a deduction in respect of the rent a hypothetical tenant would pay. In their case, Mr. Williamson said, the balance of profit upon last year's working was only £10; and he contended that there should be no entry whatever of the gas-works in the valuation roll. The Assessor admitted that the increase was rather startling, but contended that there were items in the balance-sheet which must be treated as profits. The Commissioners, he pointed out, did not intend to make a profit; all they wanted was to pay off annuities and other debts. The Court have taken time to consider their decision. There is here revealed a weakness in the law regulating the valuation of public works, which has been the cause of trouble before. A company must make profit in order to be able to pay dividend; but a corporation may run their profit down to zero, or even below it. Then the doctrine of the hypothetical tenant is not rigidly applied in the case of corporations. If they earn a large profit, the valuation is at once put up; but if they earn a small profit, or make a loss, in which event no rent could be paid except out of capital, the valuation is not correspondingly reduced or abolished. It seems to pass the wit of man to hit upon a reasonably logical, and in all cases impartial, method of valuing public works. The Assessor's view, that annuities and the

WELSBACH

SELF-INTENSIFYING KERN BURNER

Giving a Lighting Efficiency of 300 CANDLES PER BURNER with about 10 Cubic Feet of Gas

AT ORDINARY PRESSURE.

Dispensing entirely with Auxiliary Compressing Plant of any kind whatever.

Specially Suitable for Lighting Large Areas.

The most Economical and Efficient System on the Market.

The Welsbach Shadowless Lantern, with Self-Intensifying Welsbach-Kern Burner.

FOR FURTHER PARTICULARS APPLY TO THE

WELSBACH INCANDESCENT GAS-LIGHT CO., Limited,

PUBLIC LIGHTING DEPARTMENT, YORK STREET, WESTMINSTER, LONDON, S.W.

amount applied in repayment of borrowed money are profits, is one which will require the sanction of a Superior Court before it can be adopted. Annuities and sinking funds are fixed by statute; and if the Assessor's view should be adopted, the effect would be that the valuations of public works would be statutorily stereotyped. More than that, in the event of annuities being redeemed, and the borrowed money all repaid, the works would then have no valuation.

The St. Andrews Gas Company held their annual meeting on Wednesday. The Provost of the burgh (Mr. Ritchie Welch) presided, and moved the adoption of the report of the Directors. In this, it was stated that the profit for the year amounted to £1123; and a dividend at the rate of 50s. per share was recommended. The quantity of gas manufactured during the year was 39,736,000 cubic feet, or an increase of 1,526,000 cubic feet over the previous year. The number of consumers was 1844, or an increase of 39. They had now 158 prepayment meters in use, through which there was an annual consumption of about 800,000 cubic feet of gas, or an average of 5063 cubic feet per meter. The Directors proposed to reduce the price of gas from 3s. 9d. to 3s. 7d. The Chairman said that for the eminently satisfactory position of the Company, they were greatly indebted to their Managers (Messrs. Jesse and Robert Hall). The report was adopted.

Last Saturday a monument in the form of a granite obelisk was unveiled over the grave, in the Western Cemetery in Dundee, of James Bowman Lindsay, of that city, who is credited with being the first to use electricity as an illuminant. The ceremony of unveiling was performed by Sir W. H. Preece. To show the extraordinary gifts possessed by Mr. Lindsay, I give you the inscriptions which have been placed upon the monument, the last of which is a couple of quotations from writings by Mr. Lindsay:—

In memory of James Bowman Lindsay. Born at Carmyllie, 8 September 1799; died at Dundee 29 June 1862, aged 63 years. Erected by public subscription, 29 June 1901.

A pioneer in electrical science; foretold the application of electricity as an illuminant, a motive power to replace steam, and substitute for coal in heating. He devised an electrical telegraph, 1832; suggested welding by electricity, produced a continuous electric light, 1835; proposed a submarine transatlantic telegraph, 1843; and accomplished wireless telegraphy through water, 1853. As a philologist his attainments were extraordinary. In 1828 he began the compilation of a dictionary in fifty languages, uncompleted when he died. An accomplished scientist, a profound student, an earnest Christian.

The Electric Light.—The light is intensely bright, and lights may be increased without limit. Wheels may be turned by electricity, and small weights raised over pulleys. Houses and towns will in a short time be lighted by electricity instead of gas, and heated by it instead of coal, and machinery will be worked by it instead of steam.—11 April 1834.

Brilliant illumination will be obtained by a light incapable of combustion, and on its introduction to spinning mills conflagrations will be unheard of. . . . It will blaze with undiminished lustre amidst tempests of wind and rain, and, being capable of surpassing all lights in splendour, it will be used for lighthouses and telegraphs. The present generation may yet have it burning in their houses and enlightening their streets.—28 October 1835.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 21.

Sulphate of Ammonia.—There has again been good demand; and the firmness of makers alone has prevented larger business. The quotations at the close are £10 12s. 6d. per ton f.o.b. Hull, £10 15s. f.o.b. Leith, and £10 18s. 9d. f.o.b. Liverpool. The bulk of the buying has been for covering sales for September delivery. There has, however, been good direct inquiry; but buyers, not being urgent, have postponed their purchasing for the chance of doing better later. There has not been much business in the forward position, buyers so far refusing to pay the premium on spot prices demanded by makers.

Nitrate of Soda is firm at the advance; the quotations being 9s. 3d. to 9s. 4⅛d. per cwt., for ordinary and refined qualities respectively, on spot. The forward position is quieter, there being less disposition to pay the full prices demanded.

LONDON, *Sept.* 21.

Tar Products.—There is fair business doing in pitch, especially for delivery in South Wales, where the demand is very strong for early delivery. Fuel makers are evidently short of stock, and are anxious to receive deliveries by rail. This is doubtless owing to the difficulties of shipping which prevailed during the warm weather; but as it becomes cooler, matters should be easier. There are several inquiries for next year; but manufacturers do not appear anxious to contract, except at something approaching existing prices. As regards London, there is nothing offering at under 32s. for prompt or forward delivery. In 90 per cent. benzol, further business has been done at 9¼d. for September-October; and this may be taken as about the market value. There are several inquiries for next year; but manufacturers decline to quote. It is probable that the German production may be considerably reduced in 1902, in which case prices may improve. In 50-90 per cent., some small sales are reported at 9¼d. and 9½d. for September-October; but makers ask 10d. for further forward. Anthracene remains in the same depressed condition. The values are purely nominal, as the article does not seem to interest consumers. In crude carbolic, business is reported in 60's at 1s. 10d. prompt; but only to a limited extent. Consumers are willing to pay this price up to the end of the year; but makers, as a rule, ask 1s. 11d., and in some instances 2s., for October-December. Crystals are still quiet. Now that the principal English makers are sellers at 7½d. per lb., consumers are not willing to pay this price, as doubtless they can purchase on lower terms from dealers. Creosote remains very quiet in the North, although London prices are fairly steady; and there is no actual reduction to note in value on this market. In solvent, there is an absence of business, any transactions which have taken place being for very small quantities, and of special makes. One or two large contracts are at present out for tar; and it is generally thought they will realize good prices, as the competition continues strong.

The average values obtaining during the week are: Tar, 14s. 6d. to 18s. Pitch, east coast, 31s. to 32s.; west coast, 28s. 6d. to 29s.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.
BLACKBURN	1,250,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250 000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

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Sulphate of Ammonia.—The market remains in about the same position. The Gaslight and Coke Company still quote £10 17s. 6d. per ton for next year; but for prompt would no doubt accept £10 15s., at which price another large gas company placed some quantity for prompt shipment. Sales have been made at Hull at £10 11s. 3d. and £10 12s. 6d. for best makes, September shipment; while £10 15s. may be taken as the value for October-December. In Leith, business has been rather quiet; and there is nothing of importance to report. Makers still ask £10 15s. for prompt; but £10 12s. 6d. to £10 13s. 9d. may be taken as the value, although for October-March £11 is still the quotation. In Liverpool, prices have been very firm indeed for prompt; and £11 is stated to have been paid for early shipment.

COAL TRADE REPORTS.

Lancashire Coal Trade.—With the increasing demand for house coals, which are now in fairly active request, pits have got on to an average working time of four to five days per week, with the output for the most part moving away freely. Prices are firm at the full list rates. With regard to the lower qualities of round coal, supplies are not quite so plentiful now that larger quantities are being taken off the market for house-fire consumption. But there is still only a moderate demand for steam and forge purposes; and late rates are not being more than maintained. Supplies of engine fuel offering on the market become increasingly plentiful; and in face of keen competition from outside districts, local collieries are gradually easing down from the full quotations ruling of late. At the pit, best Wigan Arley coals average 15s. per ton, Pemberton four-feet and seconds Arley 13s. to 13s. 6d., common house coal 11s. to 11s. 6d., steam and forge coals 8s. 6d. to 8s. 9d., and engine fuel from 5s. 6d. and 6s. to 7s. 6d. and 7s. 9d. according to quality, with some of the very best sorts still quoted at 8s. to 8s. 3d. For shipment, a fair trade is reported in house-fire qualities at from 13s. 6d. and 14s. per ton upwards. But steam coal is only in slow request; and although the better qualities are fetching about 10s. to 10s. 6d. per ton, there are still sellers at under 10s., delivered at the Mersey ports. Good Lancashire foundry cokes at the ovens are steady at 24s. to 25s. per ton, with furnace sorts quoted at 14s. 6d. to 15s.

Northern Coal Trade.—There is continued activity in the coal trade of the North-east; but it is now more apparent in the gas coal trade than in that of steam coal. In the latter, there is full work for perhaps a fortnight or so secured; but the forward orders are limited—buyers seeming to wait for a lower range of prices, which is expected after the closing of the Baltic. For prompt demand, the price of best Northumbrian steam coals is from 13s. to 13s. 6d. per ton f.o.b.; while steam smalls are from 5s. 3d. to 5s. 9d., with a moderate demand. The tendency in the Durham coal trade is stronger; for though there will be a falling off in the demand for coal with the end of the Baltic season, it is usually more than counterbalanced by the increase in the home demand, and in that for the southern counties. In the gas coal trade, the inquiry is now fuller for home consumers, and is certain to increase for some months to come; while for export, the demand is still maintained. For early delivery, the best Durham gas coal commands 12s. per ton f.o.b; while as high as 11s. 6d. is quoted for other kinds. For contracts for delivery over periods ahead, the price most generally quoted is from 9s. 6d. to 9s. 9d. per ton f.o.b., with the variation according to the length of the period over which the delivery extends. In the coke trade, there is a good demand; and for export coke, the price is from 17s. 6d. to 18s. per ton f.o.b. For gas coke, the demand seems to be a little fuller; but there is now the increase in the production that is usual at this time of the year. Prices show no alteration.

Scotch Coal Trade.—The demand for shipping continues to improve; and the home demand is steady. Prices remain unaltered. The quotations are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. 6d. to 11s. 6d., and splint 10s. 6d. to 10s. 9d. The shipments for the week amounted to 221,365 tons—an increase of 832 tons upon the previous week, but a decrease of 52,148 tons upon the corresponding week of last year. For the year to date, the shipments have been 6,937,817 tons—a decrease upon the corresponding period of last year of 729,871 tons.

The Gaslight and Coke Company's Recent Capital Issue.—It is interesting to record the fact that the whole of the stock and debentures which the Governor at the recent meeting of the Gaslight and Coke Company announced they were making arrangements to get underwritten has been subscribed; so that the Board are relieved from any immediate anxiety as to having capital in hand to meet the pressing needs of their expanding business.

Price of Gas at Walsall.—Yesterday week, at the Walsall Town Council meeting, the Gas Committee reported that they had had under consideration the charges made for gas, in the hope of being able to make a reduction when the result of the contracts for coal and coke for the ensuing year could be ascertained. They had come to the conclusion that a reduction should be made in the price charged for manufacturing purposes other than lighting; and at the end of the present year, when the accounts were made up, they hoped to be able to recommend to the Council what the reduced charge should be from Jan. 1 for such purposes, as well as a reduction in the charge for private lighting. They had received a deputation from the Chamber of Commerce, who had urged the granting of special terms to consumers of gas for heating and motive purposes, and also the adoption of a differential scale of charge, according to the quantity of gas consumed for these purposes, as well as for private lighting. The deputation was informed that the Committee had already decided upon a reduction in the charge for gas for manufacturing purposes other than lighting; and the other question would receive consideration in due course.

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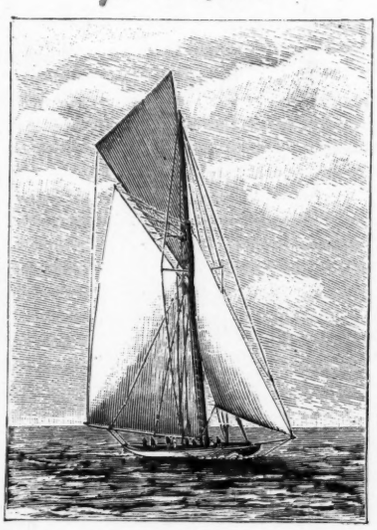

Richmond's.

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Gas Matters at Mossley.—At last Wednesday's meeting of the Mossley Town Council, Alderman Clark, in moving the adoption of the Gas Committee's minutes, announced that they had agreed to lower the price of gas by 3d. per 1000 cubic feet for illuminating purposes, owing to the reduction in the price of coal. When coal went up, they were compelled to put 4d. per 1000 cubic feet on the price of gas; and they would have liked to take off the 4d., but they could not do so. They had taken off more than the decrease in the cost of coal represented; for the latter was only a little over 2d.

The Purchase of the Prestatyn Water-Works.—At the meeting of the Prestatyn Council last Wednesday, it was stated that arrangements had been made by which the Council were able to borrow £15,000 for the purchase of the water-works owned by Mrs. MacLaren, at the rate of 3¾ per cent. The Chairman (Mr. John Jones, J.P.), asked the Council to give the Water Committee power to act, as they were anxious to get everything settled by the beginning of next season. He considered the Council were fortunate in securing such advantageous terms; and he saw no reason why the matter should not be settled in a few weeks. The Council unanimously gave the Committee power to carry the matter through.

Bingley and the Cullingworth Gas-Works.—As already announced, the representatives of the Bingley District Council and of the Cullingworth Gas Company have at length arranged the terms for the transfer of the property of the latter. The price is £9000; the Company to pay all legal costs of the transfer. At the meeting of the Council yesterday week, Mr. J. Gatecliff (Chairman of the Gas Committee) moved that the terms agreed upon by the Committee be accepted. Mr. Alfred Hartley, in seconding, said that £9000 was more by £2000 than the concern was worth; but it was the only way they had of surmounting the difficulties before them in the least expensive manner, and he was certain it would be the wisest course for the Council to adopt. The resolution was unanimously adopted.

Merthyr Water-Works Arbitration.—Mr. G. F. Deacon, M.Inst.C.E., sat as Arbitrator last Thursday, at the Surveyors' Institute, Westminster, to take evidence and decide as to a certain sum of money in question between the Merthyr District Council and Messrs. Holmes and King, Contractors, in respect of the Neuadd Water-Works. At the outset, the point was raised as to whether reporters should be present. The Arbitrator expressed the opinion that the proceedings should be conducted in private—that being, he stated, the object of an arbitration. One of the Counsel engaged read a report of the case which had appeared in a provincial morning paper, and took strong objection to the term "litigation" being applied to the matter. He said that other statements in the report were entirely misleading. He should object to the reporters being there; and his learned brothers on the other side concurred. The Arbitrator added that he was astonished that the case had got into the public Press. He requested the reporters to withdraw. It is stated that the claim is for £6745 for work done other than was provided by contract, and £23,407 for extra expenditure caused through the Council's delay—total £30,152.

Another Leeds Water-Works Land Arbitration.—Last Wednesday an arbitration took place at the Town Hall, Leeds, before Mr. F. S. Brodrick, F.S.I., of Hull, the Umpire appointed by the Board of Trade, for the purpose of assessing the amount of purchase money to be paid by the Leeds Corporation to Mrs. Holmes, of Otley, in respect of the compulsory acquisition from her of lands and buildings at Leathley, which are required by the Corporation for the purpose of their water-works. The property in question consists of 2 acres of land, on which are a dwelling-house and some buildings. The Umpire deferred making his award.

Winsford Urban Council and the Gas Supply.—Last Tuesday, the Winsford Urban Council came into possession of the Over and Wharton Gas-Works, which they have acquired at a cost of nearly £16,000. To celebrate the event, the members of the Council and others were entertained at luncheon by Mr. Cooke, the Clerk. A gas cooking-stove exhibition was afterwards opened by Lady Delamere; and, in seconding a vote of thanks to her ladyship, Mr. Cooke explained that the purchase money for the gas undertaking was £15,862, while the profits of the Gas Company last year reached £1132. By repaying principal and interest at the rate of £750 per annum, the works would become the property of the ratepayers in 40 years from the present time.

A Lady Lecturer Injured in a Gas Explosion.—After concluding a cookery lecture in the Victoria Hall, Rhyl, yesterday week, Miss Lewis, with one of the attendants, went into a room underneath the hall to turn the gas off at the meter. The attendant entered with a naked light; Miss Lewis standing at the doorway. There was a terrific explosion. The attendant was knocked down; and Miss Lewis, who encountered the full force of the explosion, was blown into the yard. The unfortunate lady sustained dreadful injuries; her head was fearfully cut, and her face and hands were terribly burnt. She was carried to an adjoining chemist's shop, where she recovered consciousness; and her injuries were dressed. The hall attendant was also badly burnt. The hall was cracked and bulged, and the windows were smashed. The explosion was heard all over the town

Gas and Electric Light Extensions at Darlington.—At the Town Hall, Darlington, last Wednesday, Mr. W. O. E. Meade-King held an inquiry into the application of the Corporation for powers to borrow £12,250 for electric lighting purposes, and £14,000 for gas-works. It was stated that the Council desired to meet the necessary demand for the electric light. Already they were providing power for 8400 lamps of 8-candle power to 106 consumers; and by the end of the year they estimated that current would be wanted for 18,000 lamps. The sum of £25,940 had been raised by loans; and the expenditure had exceeded that sum by £1670. The liabilities incurred were £3593 in excess of the existing powers. Of the money required on behalf of the gas-works, £5000 was for automatic (penny-in-the-slot) meters (£1510 having been already incurred), and £3490 estimated for three years, the rest of the money being required for gas-stoves, a new engine and exhauster, &c., incurred and prospective.

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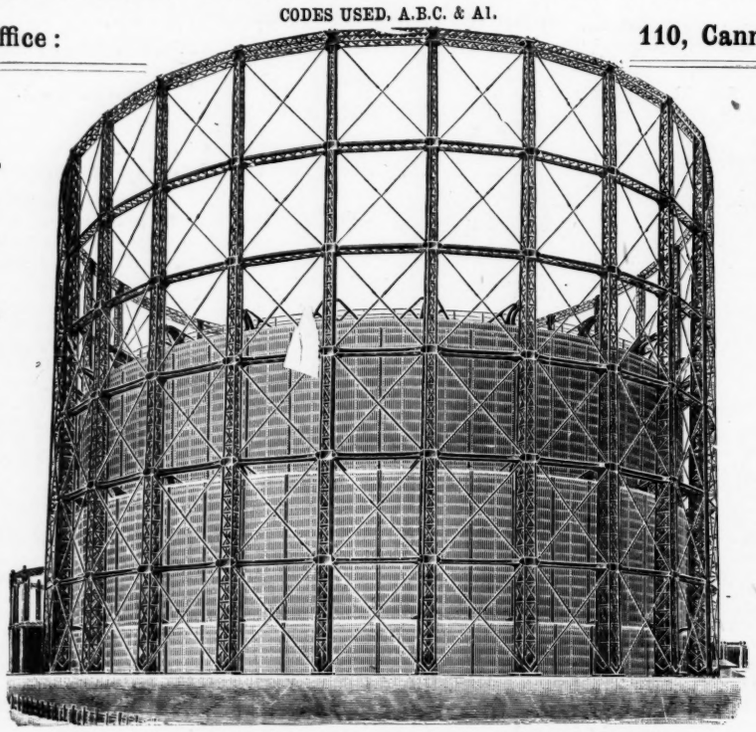

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Hungerford Gas Company, Limited.—This is the title of a concern just registered, with a capital of £10,000 in £1 shares, to take over the business now carried on at Hungerford, Berkshire, by the Hungerford Gas and Coke Company, Limited, to adopt an agreement with W. A. Schultz, and to manufacture and deal in gas, coke, tar, sulphate of ammonia, and the residual products of the manufacture of gas. The first Directors (to number not less than three nor more than five) are R. Berridge (Chairman), F. Bridges, J. Manwaring, and W. A. Schultz.

Early Days of Gas Lighting.—The pages of the "Carlisle Express" just now contain some interesting extracts from the "Carlisle Journal" during the early years of the last century. Dealing with the introduction of gas-light, the last-named paper, on April 26, 1817, wrote: We earnestly invite the attention of the public, particularly the manufacturing part of the community, to the subject of "Mercator's" letter in another column. Those who have seen the gas light have been equally astonished at its brilliancy as at the ease and universality of its application, and the saving that must be ultimately made by its introduction into large concerns. ["Mercator" describes a visit to Workington, where gas-light apparatus for the use of the harbour was being constructed upon an entirely new plan by Messrs. Boston and MacAdam. He was "much struck with the brilliant appearance of about 120 lights, each of which must have been equal to three mould candles, of six to the pound!"] On May 3, 1817, the following appeared: The system of lighting the streets of Manchester with gas is likely to be carried into immediate execution. The economy and (without a pun) the brilliancy of the measure bid fair to establish its universal use.

Municipal Coal Contracts at Lancaster.—The unsettled state of the coal market away back in the Spring was responsible for some strange proceedings—one of which is detailed in the following extract from last Saturday's "Lancaster Guardian." Our contemporary says: A few months since, the Electricity Committee and the Gas Committee advertised for tenders for coal. The Electricity Committee decided not to accept any tender, but that the Chairman and Electrical Engineer be authorized to purchase in the open market such coal as was required during the three months commencing July. The Gas Committee proposed to let contracts for a year; it being estimated that on the 16,000 tons required, they would save about £2000 on the previous year's prices. When the minutes came up for confirmation in June, Alderman Smith expressed surprise at the action of the Gas Committee. He pitted the opinion of the Electricity Committee against that of the Gas Committee, and moved, as an amendment to the recommendation of the Gas Committee, that the Chairman of the Gas Committee and the Gas Manager be empowered to obtain the supply of coal for the gas-works as required. In spite of the protests of the Gas Committee, the Council, by 14 votes to 10, accepted the advice of Alderman Smith. Now the three months for which the Electricity Committee decided to buy from hand to mouth have expired; and instead of continuing their policy, they have invited tenders for six, nine, or twelve months' supply. But the Gas Committee have not followed their lead. It will be interesting to know which policy has been the most successful, and especially whether the policy adopted by the Electricity Committee in June last, and forced by the Council on the Gas Committee, will result in a saving when the financial results of the year come to be considered.

The Monte Video Water-Works Company report for July a gross revenue of £6531, compared with £6095 for the corresponding period of last year.

A Local Government Board inquiry is to be held into an application of the New Mills Urban District Council for leave to borrow £2500 for gas-works extensions.

Tenders for £12,500 of debenture and ordinary stocks in the Southampton Gaslight and Coke Company were considered by the Directors at their meeting last Wednesday, when it was found that both stocks were over-applied for to the extent of nearly £9000.

Messrs. Kirkham, Hulett, and Chandler, Limited, have received orders for their patent "Standard" washer-scrubbers from the London and North-Western Railway Company, for erection at Wolverton, and from the Mid-Kent Gas Company for their Snodland works.

Orders have been received by Messrs. Biggs, Wall, and Co. for the erection of their manual "Rapid" charging-machines at the Ventnor Gas-Works, Southbank and Normanby Gas-Works, and Trowbridge Gas-Works; while two power machines are on order for the Shettleston Oil and Chemical Company.

Last Saturday week, a number of members of the Leicester branch of the Amalgamated Society of Engineers, together with friends, paid a visit to the Leicester Corporation water-works at Swithland and Cropstone. Mr. A. Wilby, the Cropstone Engineer, met the party, and gave an interesting explanation of the filtration system. The machinery and the well-kept engines were much admired.

Messrs. Parkinson and W. & B. Cowan, Limited, have held very successful gas exhibitions in connection with the Tipton Urban District Council Gas Department—last week at Ocker Hill, and the previous week at Dudley Port—under the supervision of the Engineer and Manager (Mr. Sydney O. Stephenson). The Ocker Hill exhibition was opened by Councillor Joseph Powell, and the Dudley Port one by Councillor T. Mansell. Cookery lectures were given daily to crowded audiences by Miss Edith Sanderson.

Mr. Thomas Fletcher, of Warrington, has intimated his intention of distributing £1000 at Christmas among the employees of Fletcher, Russell, and Co., Limited, in celebration of his having been connected with the gas industry for thirty years. The amount will be divided as follows: £50 privately among a few for special reasons and services; £250 to foremen, heads of departments, travellers, and under-foremen who have, by their own efforts, worked themselves into positions of trust, and who are responsible for workmen in their charge, according to their length of service, one share for each completed year up to Christmas, 1901; and £700 among all not included in the above, in the same manner and proportions, one share for each completed year of service—youths under twenty-one to have half-shares.

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GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY Gas Engineer, Thornhill, DEWSBURY.

TO BE SOLD—

GASHOLDER (with Wrought-Iron Tank), 30 ft. by 12 ft. Cable Guided. New in 1895.

CENTRE-VALVE, 15 in. diameter, by Walker, for Four Purifiers.

Four PURIFIERS, 10 feet square, in line, with Planed Joints, Walker Centre-Valve, Covers, and Traversing Crab Lifting Gear. Will be refixed equal to new.

Write J. WRIGHT, Bridge House, BLACKFRIARS, E.C.

TENDERS FOR NEW WORKS.

THE Directors of the Slough Gas and Coke Company invite TENDERS for the erection of NEW WORKS at Upton Lea, Slough.

Plans and Specifications may be had on application to Mr. Thomas Webb, Engineer and Manager, on payment of £3, which will be returned on receipt of a *bonâ-fide* Tender.

The Directors do not bind themselves to accept the lowest or any Tender.

Tenders, addressed "R. Martin, Esq., Chairman, Castle View, Chalvey, Slough," and endorsed "Tender for New Gas-Works," to be delivered not later than Tuesday, the 15th of October next.

By order of the Directors,
ARTHUR THOMAS,
Secretary.

High Street, Slough,
Sept. 19, 1901.

SURPLUS COKE.

TO CEMENT MAKERS AND OTHERS.

THE Directors of the Isle of Thanet Gaslight and Coke Company are prepared to receive TENDERS for the whole of the surplus COKE produced at their works, from the 1st of October, 1901, to the 30th of September, 1902.

The quantity will be about 5000 tons, more or less. Offers to be either f.o.r. or f.o.b. Margate (in the latter case the buyer paying the dues, 7d. per ton), or as the Coke lies on the Company's Works.

Tenders to be addressed to the Chairman of the Company, and to be delivered at the Offices of the Company not later than Thursday, Oct. 3, 1901.

Any further Particulars required may be obtained on application to the Company's Engineer, Mr. James Dougall.

By order,
THOS. C. FULLER, F.I.S.,
Secretary.

Company's Offices, The Dane,
Margate, Sept. 20, 1901.

ROYAL MASONIC INSTITUTION FOR BOYS.

ELECTION OF TWENTY BOYS FROM A LIST OF FORTY-SEVEN CANDIDATES.

FRIDAY, the 11th of OCTOBER, 1901.

VOTES TO SECURE THE ELECTION OF
WILFRED ALGERNON BURFIELD

WILL be thankfully received by the Secretary of the Evening Star Lodge, No. 1719, Bro. Walter T. Dunn, 47, Fentiman Road, London, S.W., or they may be sent to the Office of the "JOURNAL."

Special attention may be drawn to the following paragraph on the subject, which appeared in the "JOURNAL" for **Sept. 10**: When subscribers to the Royal Masonic Institution for Boys receive their balloting papers for the October election, they will find the name of Wilfred Algernon Burfield among the accepted candidates. This is the only son of the late Bro. F. G. Burfield, Assistant Secretary of the Tunbridge Wells Gas Company, and previously Secretary to the Gas Institute, who was initiated in the Evening Star Lodge, No. 1719, in June, 1894, and remained a Subscribing Member until his death in December, 1899. His widow, who suffers from an affection of the eyes, is left in such poor circumstances that the Evening Star Lodge have taken up the candidature of her child, to assist in his election into the Institution. The case is strongly recommended.

It may be added that the Candidature is receiving good support; but as it is earnestly desired to secure the election at the first attempt, and about 4500 votes will be required, an urgent appeal is made for assistance.

MANCHESTER CORPORATION GAS-WORKS.

TO CONTRACTORS.

THE Gas Committee are prepared to receive TENDERS for the supply of a TEN-TON LOCOMOTIVE TIPPING CRANE for the Bradford Road Station.

General Specification, &c., can be obtained on application to Mr. C. Nickson, Superintendent, Gas Department, Town Hall.

Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Tipping Crane," must be delivered at the Gas Offices not later than Ten a.m. on Wednesday, the 2nd of October, 1901.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Sept. 20, 1901.

MANCHESTER CORPORATION GAS-WORKS.

TO CONTRACTORS.

THE Gas Committee are prepared to receive TENDERS for the supply, delivery, and erection of a WASHER SCRUBBER at their Rochdale Road Gas Station, capable of passing 175,000 cubic feet of Gas per hour.

General Specification, &c., can be obtained on application to Mr. C. Nickson, Superintendent, Gas Department, Town Hall.

Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Washer-Scrubber," must be delivered at the Gas Offices, Town Hall, not later than Ten a.m. on Wednesday, the 2nd of October, 1901.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Sept. 20, 1901.

COUNTY BOROUGH OF HALIFAX.

TO ENGINEERS AND CONTRACTORS.

THE Gas Committee invite Tenders for the supply and erection of a mild Steel OVERHEAD STORAGE CISTERN, required at their Tar-Works, Charlestown Road, Halifax.

Specification, Form of Tender, and Print may be obtained on application to Mr. Thomas Holgate, M.Inst.C.E., Gas Engineer. A deposit of One Guinea is required, which will be refunded on receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Overhead Storage Cistern," are to be delivered to the Town Clerk, Town Hall, Halifax, not later than Twelve o'clock noon, on Wednesday, the 2nd of October, 1901.

The Corporation are not pledged to accept the lowest or any Tender; and the Contractor whose Tender is accepted will be required to observe the Fair Contracts Clauses adopted by the Corporation.

KEIGHLEY WALTON,
Town Clerk.

Town Hall, Halifax,
Sept. 19, 1901.

COUNTY BOROUGH OF HALIFAX.

TO TAR DISTILLERS.

THE Gas Committee invite Tenders for the purchase of 2000 Tons of TAR, 600 Tons of which is in Stock.

The whole of the Tar is to be removed at the rate of 350 Tons per month. Delivery may be by boat, or by rail.

Any further Particulars may be obtained on application to Mr. Thomas Holgate, M.Inst.C.E., Gas Engineer.

Sealed Tenders, endorsed "Tar," are to be delivered to the Town Clerk, Town Hall, Halifax, not later than Twelve o'clock noon, on Wednesday, the 2nd of October, 1901.

The lowest or any Tender will not necessarily be accepted, and the Corporation reserve the right to divide the Contract.

KEIGHLEY WALTON,
Town Clerk.

Town Hall, Halifax,
Sept. 19, 1901.

THE Woodstock Gaslight, Coke, and Coal Company, Woodstock, Oxon, invite TENDERS for the supply of a good GAS COAL, delivered free at Blenheim and Woodstock Station (Great Western Railway). Their last year's consumption of Coal was 464 Tons.

RADCLIFFE AND PILKINGTON GAS COMPANY.

TO TAR DISTILLERS.

THE Directors of this Company invite TENDERS for the purchase of the surplus TAR, to be produced at their Works in Radcliffe during the Twelve Months commencing the 1st day of November next.

Particulars may be obtained from the undersigned, to whom endorsed Tenders must be delivered not later than Tuesday, the 1st of October.

JAMES BRADDOCK,
Manager and Secretary.

Gas-Works, Radcliffe,
Sept. 23, 1901.

CITY OF BELFAST.

CONTRACT FOR COAL.

THE Gas Committee of the Belfast Corporation invite TENDERS for a supply of 100,000 Tons best screened GAS COAL, to be delivered free and trimmed in Barges at Belfast Harbour, between Oct. 1, 1901, and Sept. 30, 1902.

No Tender for less than 10,000 Tons will be considered.

Monthly Quantities and Particulars may be obtained from the Manager of the Gas-Works.

Tenders, on Office Forms, endorsed "Tender for Coal," must be delivered at my Office not later than the 10th of October, 1901.

The lowest or any Tender not necessarily accepted.

SAMUEL BLACK,
Town Clerk.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that an EXTRAORDINARY GENERAL MEETING of the Shareholders of the Georgetown (British Guiana) Gas Company, Limited, will be held at the Offices of the Company, No. 30, Gracechurch Street, London, E.C., on Tuesday, the 15th day of October next, at Half-past Two in the afternoon, when a Resolution will be submitted to the effect that, having regard to the result of the working of the Company for some time past, it is impossible for the Company to continue to carry on its business, and, therefore, that the Works be closed at such time as may be fixed by the meeting. And if such Resolution, with any amendment or variation, should be adopted, such other Resolutions will be proposed as may be necessary for carrying the same into effect.

Dated the 23rd of September, 1901.

SAMUEL WOOD,
Secretary.

Offices: 30, Gracechurch Street,
London, E.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
PINNER GAS COMPANY, LIMITED.

400 £5 ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Oct. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 500 ORDINARY £10 SHARES
AND
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Oct. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

1000 £10 NEW ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Oct. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

DOVER GAS COMPANY.

IMPORTANT ISSUE OF £10,000 OF NEW STOCK,
UNDER THE PROVISIONS OF THE DOVER GAS ACT, 1901.

MESSRS. WORSFOLD & HAYWARD are favoured with Instructions from the Directors to SELL BY AUCTION, at the Metropole Hotel, Dover, on Thursday, the 17th of October, 1901, at Three o'clock p.m. precisely, in convenient Lots,

£10,000 OF NEW ORDINARY STOCK
IN THE
DOVER GAS COMPANY.

This Stock is in all respects equal to the existing Stock and Shares, which have paid the full Parliamentary Dividend of 7½ per cent. since 1874.

The present price of gas is 2s. 11d. per 1000 cubic feet, whereas the price authorized by the Company's Act is 5s. 3d.; thus giving ample security for the payment of the full Dividend on the increased Capital, apart from the increasing consumption.

Particulars, with Conditions of Sale, may be obtained of the Secretary of the Company, Mr. GEORGE FIELDING, Solicitor, 14, Snargate Street, DOVER; at the COMPANY'S OFFICES, Russell Street, DOVER; and of Messrs. WORSFOLD AND HAYWARD, Auctioneers, Surveyors, and Estate Agents, DOVER, and 80, Cannon Street, LONDON, E.C.

BATTERSEA POLYTECHNIC.

Principal, SIDNEY H. WELLS,
Wh.Sc., A.M.Inst.C.E., A.M.Inst.M.E.

GAS MANUFACTURE.

MR. J. G. TAPLAY (Gaslight and Coke Company), Ordinary and Honours courses—Lectures and Laboratory work — on Wednesday and Thursday evenings respectively. Fees per Session: Members 7s. 6d., Non-Members 8s. 6d.

Abridged Prospectus free on application. Detailed Prospectus 1d., post free, 3d.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars Price, &c., apply to Mr. EDWARD PRICE, "Langley," Wyke Avenue, WORTHING.

Prices are Reduced.

DISPENSE WITH CANNEL COAL
and
INCREASE YOUR ILLUMINATING POWER
by using the
WHESSOE-MUNICH BENZOL CARBURETTER
The Cheapest and Best in the Market.

The Managers of Tynemouth, Middlesbrough, and Darlington Gas-Works are much pleased with it, and would not be without it.

Apply to the Sole Makers:
THE WHESSOE FOUNDRY COMPANY, LIMITED, DARLINGTON.

Foolscap 4to, pp. 535, with 239 Illustrations and Steel Plate Engraving (as Frontispiece) of WILLIAM MURDOCH, *Inventor of Gas Lighting. Morocco Gilt, 21s.; Roan Gilt, 18s.*

THE SIXTH (AND CENTENARY) EDITION
OF THE

HANDBOOK
FOR
GAS ENGINEERS AND MANAGERS.

BY

THOMAS NEWBIGGING,
M.Inst.C.E.

LONDON:
WALTER KING, 11, BOLT COURT,
FLEET STREET, E.C.

Net Price: Cloth Bound, 12s. 6d.; Morocco Gilt, 18s.

GAS COMPANIES'

BOOK-KEEPING.

A Practical Treatise on the Keeping of Gas Companies' Accounts.

By

JOHN HENRY BREARLEY & BENJAMIN TAYLOR,

OF LONGWOOD.

It is the fruit of 33 years of practical and professional experience. It is very painstaking and complete. A large portion of the matter is adaptable to the book-keeping of Local Authorities. A thoroughly practical and excellent work.—*Glasgow Herald.*

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TROTTER, HAINES, & CORBETT, LIMITED,

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FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY

RAVENSTHORPE, NEAR DEWSBURY.

THE

"ST. HELENS" LANTERN

Fitted with Steel Enamelled White Reflector.

A. E. PODMORE & CO.,

GAS LIGHTING ENGINEERS AND CONTRACTORS,

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COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

With Elevators and Conveyors worked by Steam or Gas Engine.

GEORGE WALLER & CO.

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And at STROUD, GLOUCESTERSHIRE.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

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SULPHURIC ACID.

MADE from Spent Oxide (free from Arsenic) and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

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Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

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TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE, SON, & HUNTER,

COAL OWNERS, NEWCASTLE-ON-TYNE

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NITRATE of Thorium and Cerium,

FABRIK CHEMISCHER PRAEPARATE VON STHAMER NOACK, AND CO., HAMBURG.

THE

"KILBURN" LANTERN.

Fitted with Steel

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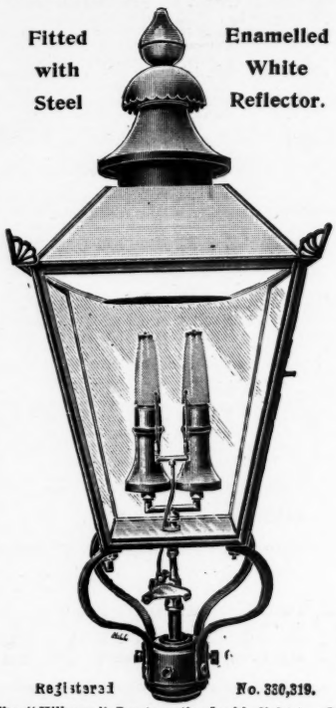

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HYDRAULIC BLOWER

For blowing Air into Gas Purifiers for the purpose of

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Full Particulars on application.

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ALFRETON IRON-WORKS, DERBYSHIRE,

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Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

BRAY'S "SPECIAL" GAS BURNERS.

Union-Jets.

Screwed for Globe Holder.

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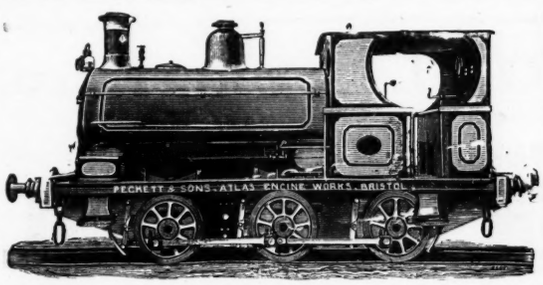
Screwed for Globe Holder.

The Premier Light of the Present.

GEO. BRAY & CO., Gas Lighting Engineers, BAGBY WORKS, LEEDS.



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LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for immediate Delivery.

Photographs, Specifications, and Prices on Application.

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Telegraphic Address: "PECKETT, BRISTOL."

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THESE CONVEYORS ARE NOW WORKING IN ENGLAND

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Guaranteed by Sole Makers:

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Prices and Analysis of all the Scotch Cannels on Application.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
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SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
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STEEL OF ALL DESCRIPTIONS.
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FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.
Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— LIMITED, —
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STEEL SCOOPS
FOR
RETORT CHARGING.
No 2

Scoops supplied with or without handles, and of any dimensions or shape required.
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A DESCRIPTION
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ZURICH NEW GAS-WORKS.
By A. WEISS, Engineer of the Works.
Translated from the German for, and Reprinted from, the "JOURNAL."
LONDON: WALTER KING, 11, BOLT COURT, FLEET ST., E.C.

THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
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ALDWARKE MAIN GAS COAL
Analysis: 12,600 Feet of 19-Candle Gas per Ton.
Value in Pounds of Sperm, 820·80.
VERY FREE FROM IMPURITIES.
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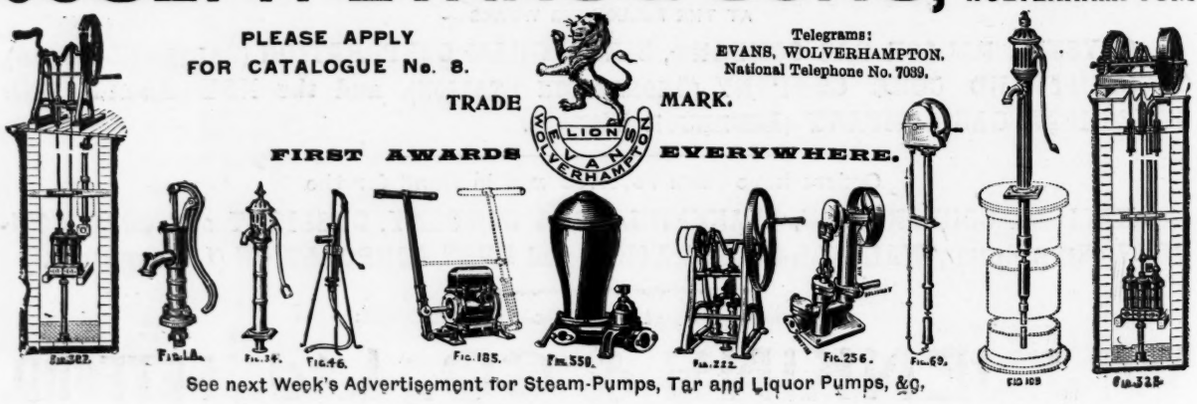

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Works: SEACOMBE, CHESHIRE.

BRANCHES;—

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40 Awards!!

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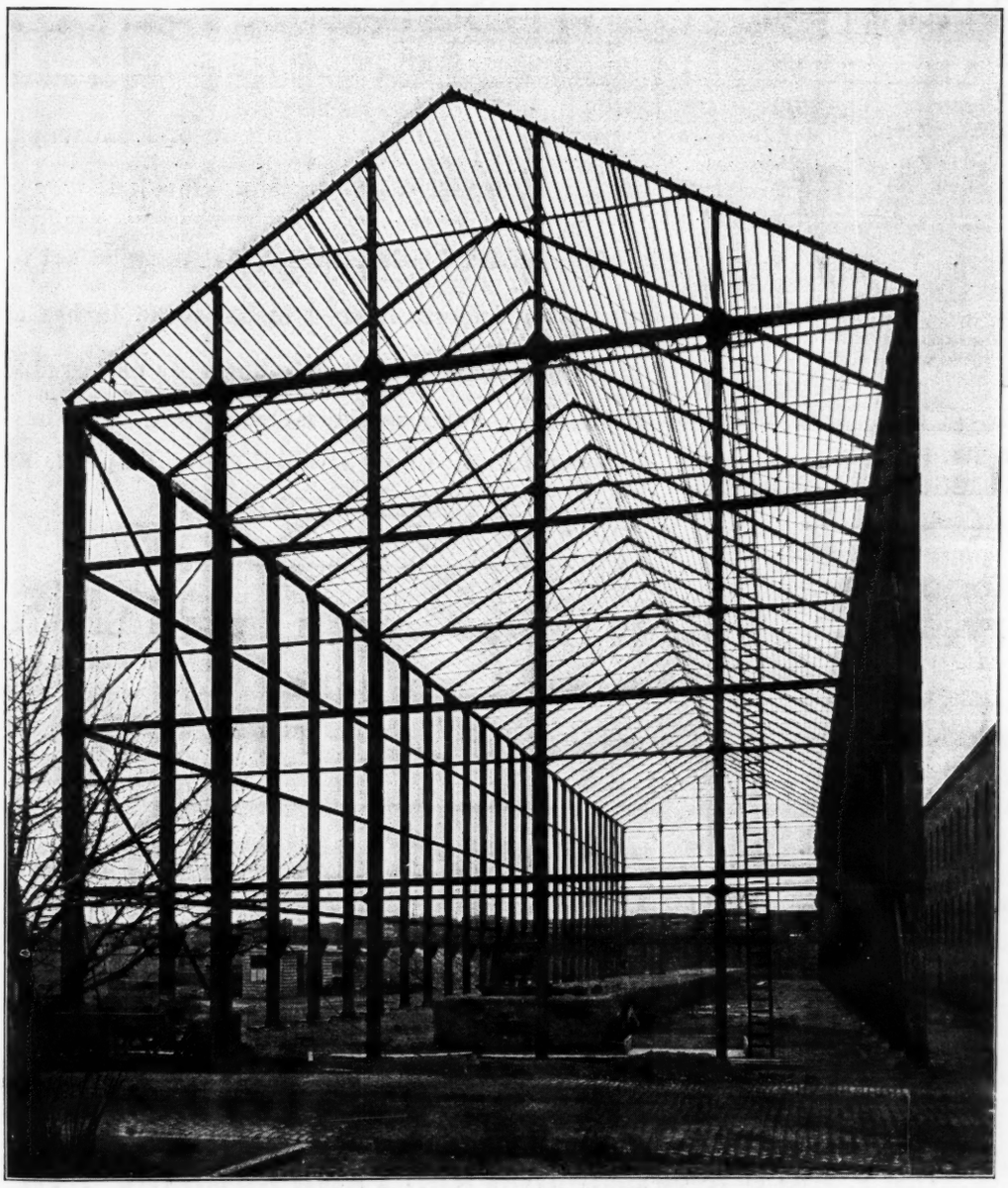
WE MAKE A SPECIALITY OF ENDLESS BELTS FOR BLOWERS.

S. CUTLER & SONS, MILLWALL, LONDON.



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STEEL RETORT-HOUSE RECENTLY ERECTED BY MESSRS. CUTLER.

GASHOLDERS. CARBURETTED WATER-GAS PLANT. **OIL-TANKS.**

SCOTT-SNELL
SELF-INTENSIFYING LAMP.

Automatic Action.

No Complex Mechanism.

"Power" Free of Cost.

TYPE OF SCOTT-SNELL LAMPS
NOW IN USE
AT THE GLASGOW EXHIBITION.

INTENSIFIED LIGHT

WITHOUT Compressing Plant, Special Gas-Service, Water Bill, Gas-Engine or other Pumping Appliances, tearing up of Roadways, or interference with existing Service.

The **SCOTT-SNELL LAMP** may be set to give any pressure from **4 inches to 36 inches of Water; 8 inches to 10 inches is usually preferred.**

Lanterns supplied with Single, Duplex, or Cluster of Burners.

TO GAS ENGINEERS AND MANAGERS.

At the Stand on the North Bank of the Kelvin, an attendant will be pleased to give full explanation, and to show the action of the Lamp.

This unique Illustration of Wasted Bye-Products (heat in escaping products of combustion) effecting, without cost, all that is elsewhere reached by special motive power and special distributing Mains, should not be missed.

350 to 500 Candles from a Single Burner, with an efficiency of 35 Candles per cubic foot of Gas.

The ONLY High-Pressure Lamp.

THE LAMPS MAY BE INSPECTED AT ANY TIME BY APPOINTMENT.

THE SCOTT-SNELL SELF-INTENSIFYING GAS-LAMP COMPANY, LTD.,

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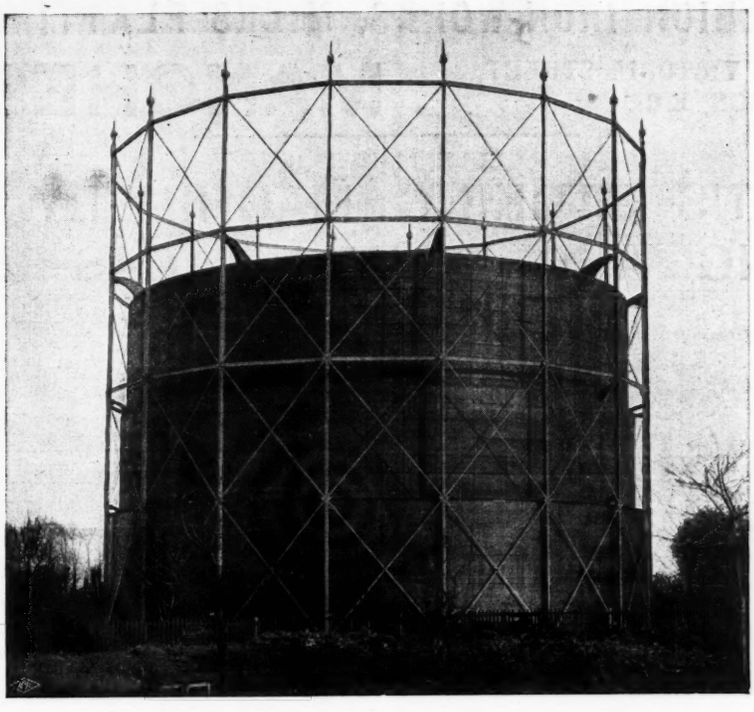
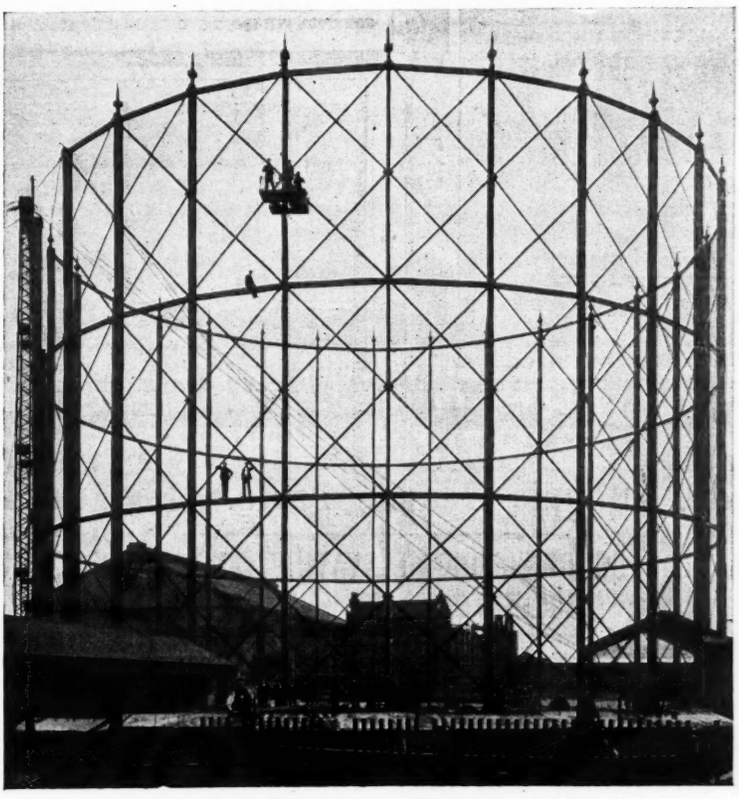


Three-Lift Gasholder and Steel Tank, 90 feet diameter by 14 feet deep, recently erected for the EPSOM GAS COMPANY.



Three-Lift Gasholder, 145 feet diameter by 35 feet deep, in course of construction for the WANDSWORTH & PUTNEY GAS COMPANY.

GASHOLDERS and TANKS.

RETORTS, PURIFIERS, CONDENSERS, SCRUBBERS.

GAS-GOVERNORS, STATION METERS CONSUMERS' METERS, PREPAYMENT METERS.

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WEST'S GAS IMPROVEMENT CO., LTD.,

ALBION IRON-WORKS, MILES PLATTING,

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WEST'S STOKING MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.

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INTERIOR OF RETORT HOUSE SHEWING COKE CONVEYOR.

SECTION OF COKE CONVEYOR.

Silent in Action. Simple Wearing Parts. Does not make Breeze.

SPECIALLY ADAPTED FOR CONVEYING, ELEVATING, AND STACKING HOT COKE FROM GAS-RETORTS OR COKE-OVENS.

The Conveyor after leaving the Retort-House may be arranged to rise up an incline to any required height, and the Coke delivered from the Conveyor to the Coke-Store from any part of the Conveyor.

ALSO MAKERS OF

West's Coke Breaking, Sorting, Sizing, and Screening Machinery.
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Coal-Handling Machinery for Gas and Electric Light Works.

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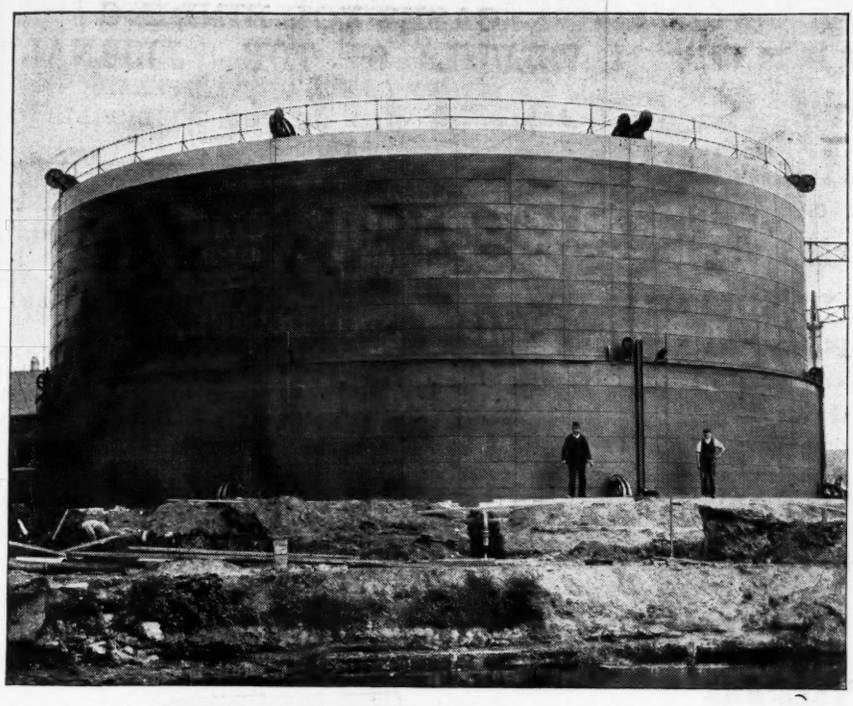

Two-Lift Cable-Guided Gasholder, 80 ft. diameter by 20 ft. deep.
STAFFORD CORPORATION GAS-WORKS. (*From a Photo.*)

COPY OF TESTIMONIAL.

CORPORATION OF STAFFORD,
GAS & ELECTRICITY DEPARTMENT,
STAFFORD, *Feb.* 9, 1899.

Messrs.
ASHMORE, BENSON, PEASE, & CO., LTD.,
Stockton-on-Tees.

GENTLEMEN,

It affords me pleasure to state that our No. 2 Gasholder, from which you removed the outside Guide-Framing on account of it being defective due to the settlement of the foundations, and substituted your Steel-Wire Cable System for both Inner and Outer Lifts, has, since the alteration, **worked perfectly satisfactory.**

Its Stability and Rigidity under High Wind Pressures, when fully inflated, is such that it **preserves the level working of both Lifts, and gives a steady outlet pressure.**

I am, sincerely yours,
JNO. FERGUSON BELL,
Engineer.

PATENTEES AND MANUFACTURERS:

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ALL SIZES.

GAS AND WATER APPARATUS
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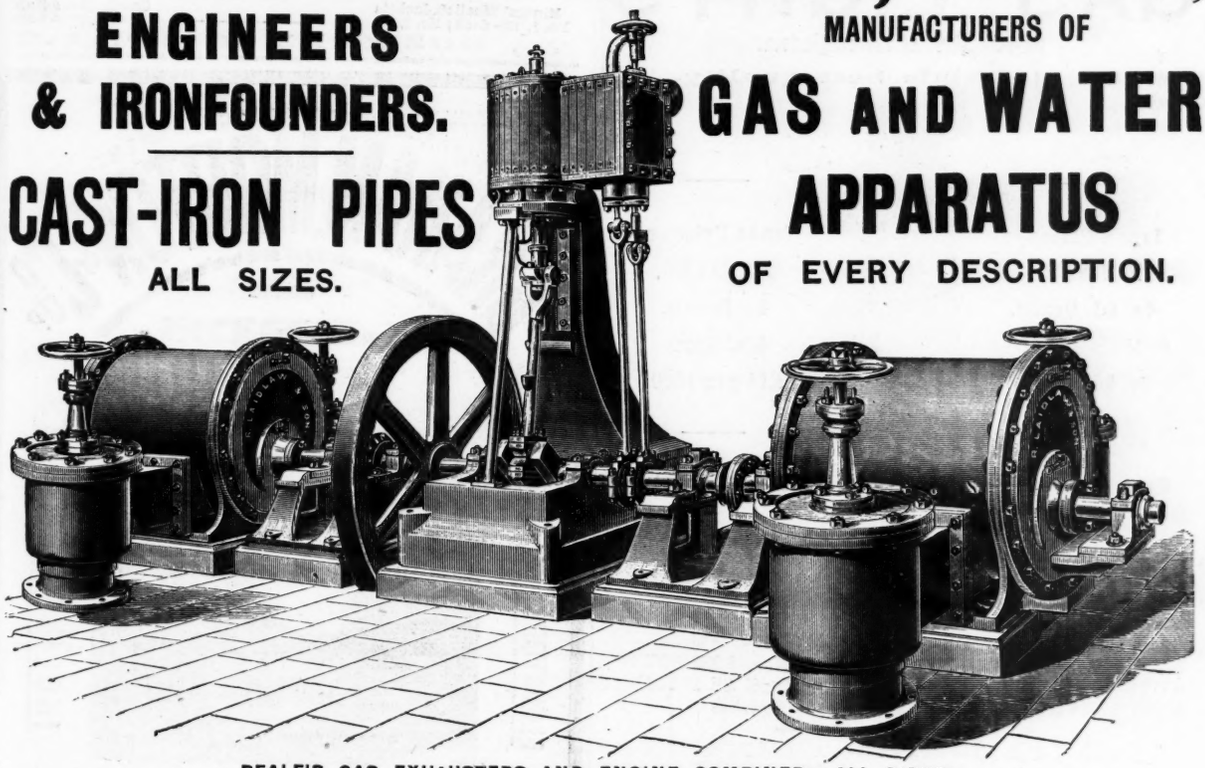

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NITRATE OF THORIUM,

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All Materials guaranteed first class.

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Patent Automatic Machinery

FOR

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GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,

GLASGOW.

[See Illustrated Advertisement, Sept. 3, p. 549.]

Incandescent

GAS LIGHTS

Made in Birmingham.

All Materials best quality.

Trade Prices of
BURNERS,
4s. 6d. Dozen,
or with Galleries
7s. 6d. Dozen.

Cash with Order.

Trade Prices of
MANTLES,
4s. Dozen.
42s. Gross.
£14 per 1000.

Samples 1/3 post free.

NOTICE.—The Birmingham Incandescent Lighting Company, Ltd., actually Manufacture **ALL** Mantles sold by them, and **DO NOT USE OXIDE OF CERIUM.** They therefore **CANNOT BE INFRINGEMENTS,** even supposing the Welsbach Patent to be valid.

THE

Birmingham Incandescent Lighting Co., Ld.,

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MAY BE HAD OF THE PUBLISHER
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(RICHARD FEUER)

BERLIN-SCHÖNEBERG, BAHNSTRASSE, 22,

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(Equal Light during 1000 Hours).
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The Cheapest Intensive Burner.

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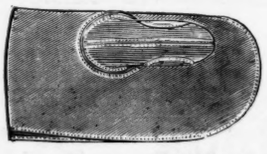
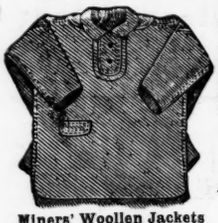


BELLOWS made to inflate a 48-inch Bag under One Minute. Various sizes made.



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Made from best Tanned Leather.

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Best Materials and Workmanship Guaranteed.

Miners' Woollen Jackets
No. 1, 12/- each; No. 2, 9/6.

Gas-Bags for Mains
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MAURICE GRAHAM.

CONTRACTORS TO H.M. GOVERNMENT.

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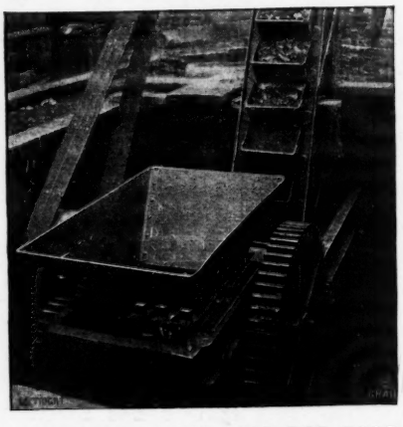
WORKS:

LEEDS.

ELEVATORS & CONVEYORS.



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PHOTO, SHOWING ELEVATOR FOR COLD COKE.

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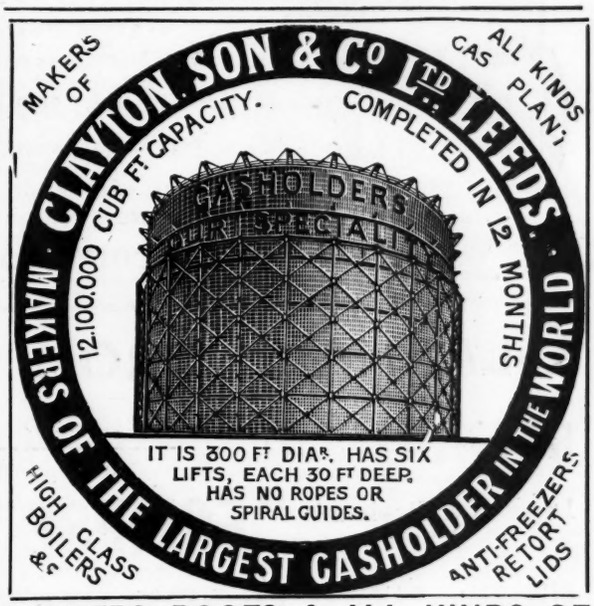
ESTABLISHED 1860.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ALL KINDS GAS PLANT
COMPLETED IN 12 MONTHS
12,100,000 CUB FT CAPACITY.
GASHOLDERS
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IT IS 300 FT DIAM. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
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IMPROVED Water-Cooled Condensers

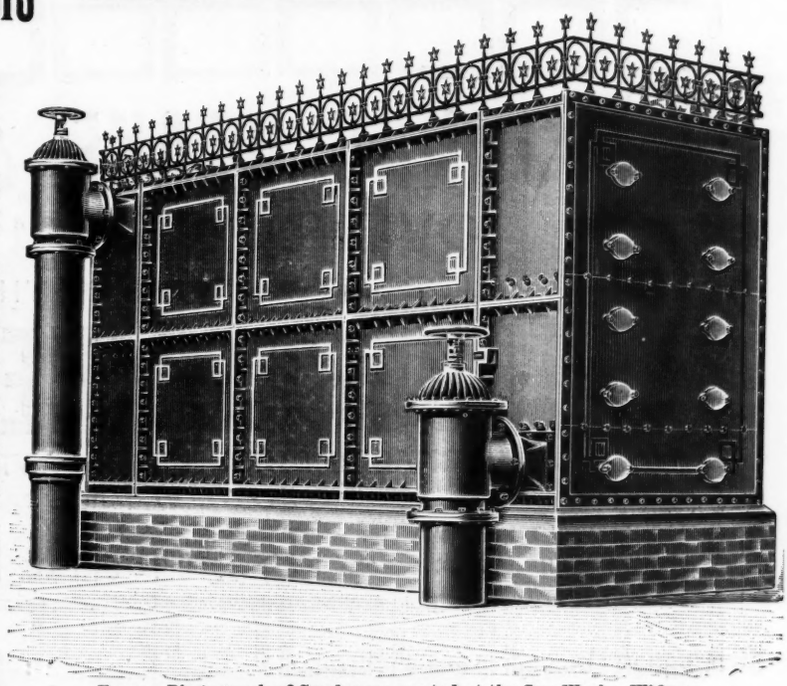
This water-cooled Gas Condenser is designed to work against the great variations of temperature between day and night, sunshine and shade, summer and winter, which are found in this and other countries.

Water being the cooling medium, the temperature of the gas can be kept under control better than with air; and the gas can be sent forward to the purifying plant at the proper temperature for efficient and economical purification.

The cold water enters at the bottom, and gradually rises to the top as the water absorbs heat, thus causing the warm gas to meet the warm water first, and to leave the Condenser in contact with water at any desired temperature by simply regulating the feed-water tap. The gas is thus **cooled progressively, uniformly, and effectually.** The simple construction of this Condenser affords a large cubical capacity, so that the gas remains in a considerable time, and secures all the advantage due to slow-speed condensation. Every part of the Condenser is easily accessible, and by removing the end plates the whole of the interior can be got at. It can be erected under cover, and protected from extremes of heat or cold.

R. & J. DEMPSTER, LTD., recommend this Condenser to be used as a Finishing Condenser, after the gas has already passed through the ordinary Annular or Air Condensers.

Condensers of this type equal to 10,500,000 cubic feet per 24 hours already erected and at work.



From a Photograph of Condenser erected at the Gas-Works, Widnes.
Capacity 1,500,000 cubic feet per 24 hours.

HUTCHINSON BROS. & CO. LD.

GAS ENGINEERS, &c.,

MANUFACTURERS OF

Improved Wet & Dry Gas-Meters.

STATION-METERS. LAMP-METERS.

Test Gasholders and General Gas Apparatus.

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